

1551-8

HARTZELL

Charaway

FANS

PARENT & KIRKBRIDE, District Rep.
1715 Rittenhouse St., Phone Kingsley 2341
Philadelphia, Pa.



HARTZELL PROPELLER FAN CO.

Originators of Propeller-Type Ventilation

DIVISION OF HARTZELL INDUSTRIES, INC.
PIQUA, OHIO, U. S. A.
SALES-ENGINEERING OFFICES IN PRINCIPAL CITIES

A



I N D E X

FACTORS INSURING SATISFACTION

Page

Advanced Engineering	2
Manufacturing Facilities	3

FANS

Single-Propeller Standard Fan	4-5
New Tear-Drop Fan	6-7
Belt Drive Tear-Drop Fan	6-7
Birdwing Fan	8-9
Two-Propeller Standard Fan	10-11
Multiblade Standard Fan	12-13
Extension Shaft Fan	14
Pulley Drive Fan	15
Utility Fan	16
Industrial Stand Model Fan	16
Cool Blast Fan	17
Blower	18
Birdwing Air Circulators	19
Tear-Drop Adjustable-Pitch Fan	20
Penthouse, Automatic Shutter and Other Accessories ..	21
Full Power Unit Heater	22

CATALOGUE

Number 11

TYPICAL INSTALLATIONS

Ventilation; Dispersing Fumes; Dispersing Heat; Exhausting Moisture; Controlling Fog; and Drying.....	23
--	----

DATA

Pipe Sizes (ducts) showing Static or Resistance	
Pressure (inches W. G.)	24
Areas and Circumferences of Circles and Sides of Squares of Equal Area	24

NOTE:—Extension Shaft, Pulley Drive, Utility, Industrial Stand Model and Cool Blast fans are shown equipped with standard propellers. Extension Shaft, Pulley Drive and Cool Blast models are regularly available equipped with any Charavay propeller. Utility and Industrial Stand models are regularly equipped only with Single-Propeller Standard blades, but can be furnished on special order with any propeller. Refer to Rating Tables for sizes and air deliveries.

NOTE:—We are particularly well equipped, as a designer of airplane propellers, to design and produce special mountings, propellers and equipment at reasonable cost. Last year we designed and made nine fans each moving 250,000 cubic feet per minute for one company. A co-ordinated Hartzell installation is removing 52,000,000 cubic feet of air per hour from one large plant.

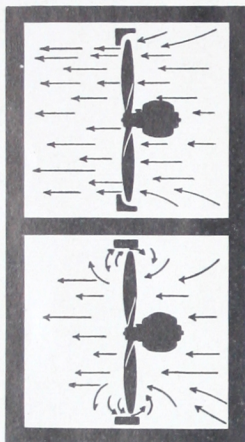


Copyright 1938, Hartzell Propeller Fan Co.
Piqua, Ohio, U. S. A.

Advanced Engineering Identifies Hartzell Products

Hartzell, one of the leading airplane propeller manufacturers, originated the propeller-type fan, and has made and sold more of them than any other manufacturer. Hartzell propeller-type fans are engineered and precision built.

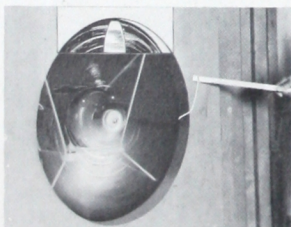
THE CHARAVAY OVERLAPPING RING



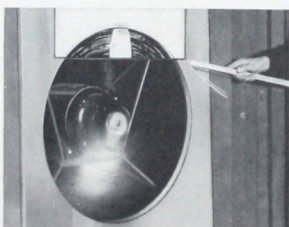
Overlapping Ring Mounting
(Note smooth flow of air throughout length of propeller)

Ordinary Mounting
(Note roiling of airstream at propeller tips)

The greatest single deficiency of the propeller fan is that, without an encircling ring, or with the conventional ring which is placed just outside the propeller tips, air in considerable volume flows back through the propeller at its tips. This results in a loss of 20% or more in air delivery, and also creates a "fuzzy" air stream which causes friction in its passage, therefore reducing its length of travel.



Tie an ordinary piece of wrapping string on a stick—lower its end just inside the ring; with the conventional ring mounting, the string will be drawn back through the opening, proving clearly the presence of air backflow; with the Charavay overlapping ring mounting, the string will be blown out, proving the absence of air backflow.

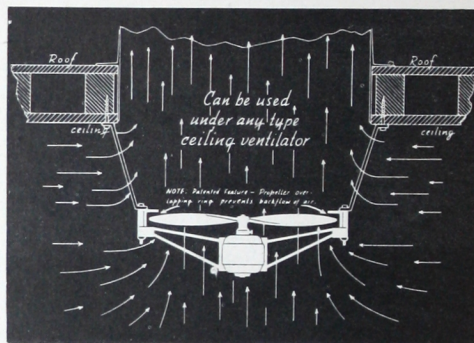


It was discovered by Hartzell engineers that by making a ring slightly smaller in diameter than the length of the propeller and placing this ring just in front of the propeller, this back-flow of air was eliminated. Air-tunnel tests show that the absence of back-flow with this ring increases effective air delivery by 20% or more. It also allows the production of a sharp air stream, reducing friction to a minimum and greatly increasing the length of throw.

The Charavay Overlapping Ring is patented and is used exclusively on Hartzell fans.

CHARAVAY INDUCED DRAFT

Because of its sharp, powerful air stream the Hartzell fan can be mounted approximately half its diameter from a duct opening. The air stream enters the duct perfectly, and in addition pulls air in from behind the fan, actually increasing the amount of air delivered above the fan's rated capacity.



Induced Draft Mounting

Mounting a conventional fan in this manner would result in loss, instead of gain, since the indefinitely defined air stream bulges out" in leaving the fan.

CHARAVAY PROPELLERS

In contrast to mass production of stamped or cast propellers, Charavay propellers are designed by the same engineers who give Hartzell airplane propellers their pre-eminent position, and built in the same plant. They are not merely polished after casting, but are machined to micrometer accuracy. Just as the precision of an airplane propeller determines its value, so does precision of manufacture in a propeller-type fan affect its efficiency. The slightest inaccuracy in a propeller may cause it to lose as much as 25% of its potential air delivery.

CERTIFIED RATINGS

All Charavay air deliveries are in accordance with Standard Test Code for Centrifugal and Propeller Fans, adopted jointly by the National Association of Fan Manufacturers and American Society of Heating and Ventilating Engineers. Every Charavay propeller is tested in five positions before approval. Every Hartzell fan is tested in operation before shipping.

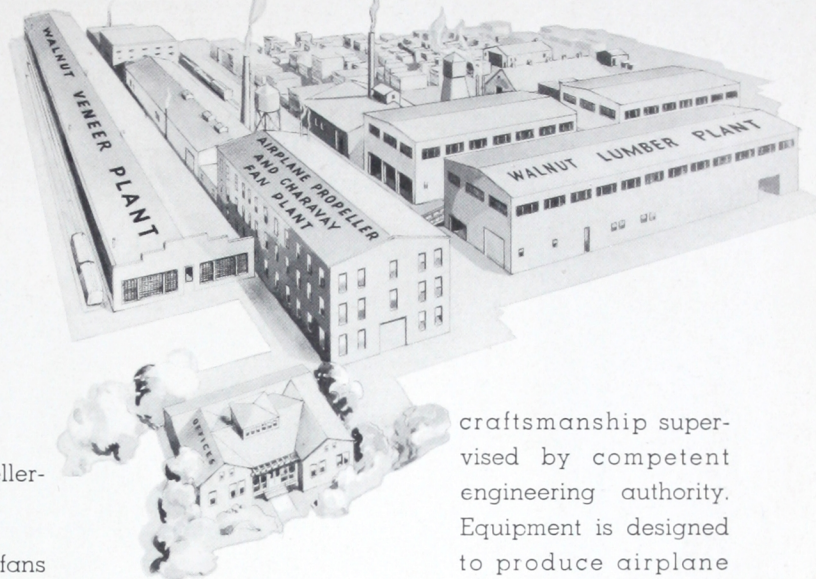
Hartzell Facilities Insure Reliable Service

Success in achieving propeller-type fan efficiency rests first in the engineering organization which designs the equipment. In turn, the history of that organization indicates its ability. The following four facts show the foundation on which Hartzell has progressed:

- 1 — Hartzell has manufactured airplane propellers since 1916.
- 2 — Hartzell originated the propeller-type fan in 1926.
- 3 — Hartzell is acknowledged to lead in propeller-type fan engineering.
- 4 — Hartzell has sold more propeller-type fans than any other manufacturer.

The plant facilities with which the engineering staff can work are also of major importance. Hartzell maintains three wind tunnels with which experiments and testing operations are continually being made. These tunnels are operated under standards set by the American Society of Heating and Ventilating Engineers. Decibel equipment is used to measure the production of sound by fan operation.

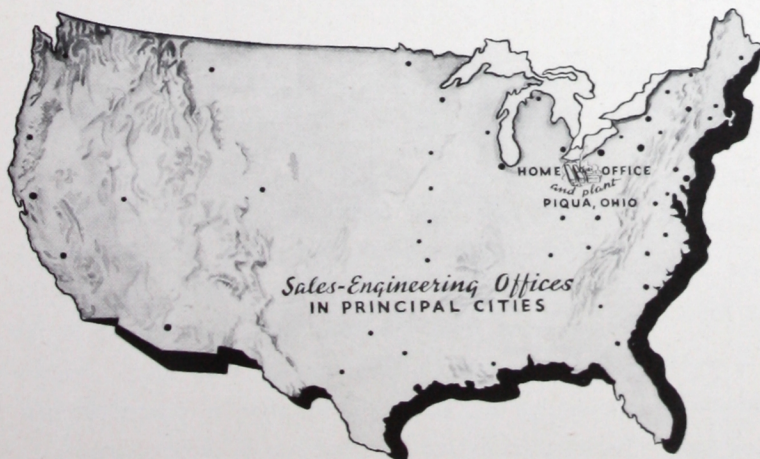
Facilities for mass production in the Hartzell propeller and fan plant are conspicuous by their absence. Each propeller and fan produced is a masterpiece of



craftsmanship supervised by competent engineering authority. Equipment is designed to produce airplane propellers and propeller-type fans which will move the maximum amount of air per dollar — not only in first cost but also in operation and upkeep.

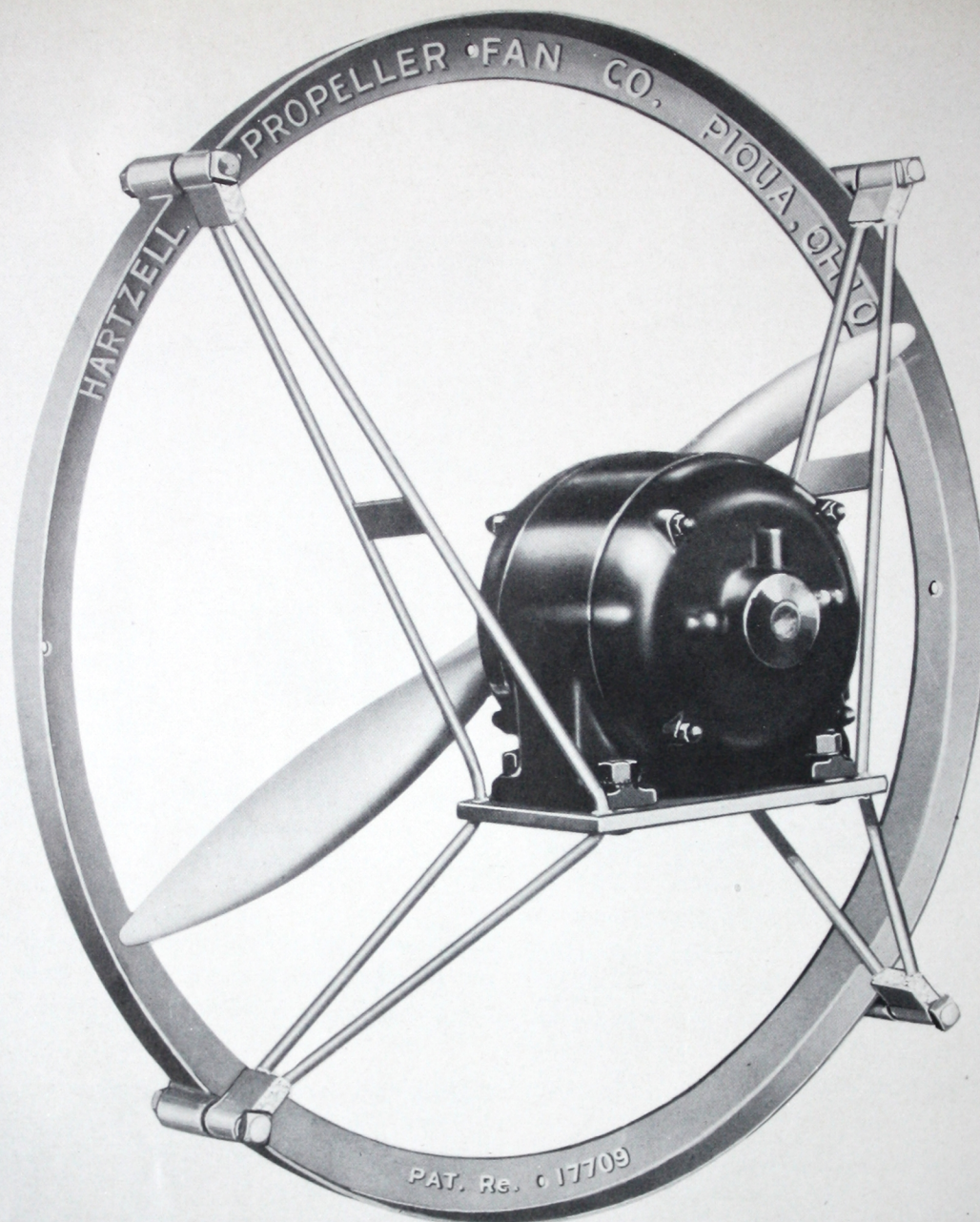
The Hartzell plants are extensive and complete, but are managed and operated so as to hold overhead down, allowing economical selling prices.

Hartzell direct sales-engineering offices are located in principal cities throughout the United States. These offices are strategically located to serve industry in every area with speed. Hartzell fans are also distributed and serviced in many foreign countries.



When you call in Hartzell assistance you summon the longest and largest experience in propeller-type air movement, and gain the benefit of manufacturing, distribution and service facilities of the first rank.

Feel free to ask the advice and assistance of your Hartzell representative at any time.



The Charavay Single-Propeller Standard Fan

This, the first propeller-type fan ever to be designed, continues year after year to be the most popular air-moving device for general industrial use. It moves maximum air per dollar and per horsepower, and operates with almost no attention and without reduction in efficiency. Propeller is of machined cast aluminum alloy, tested in five positions before mounting. Motor suspension is of the electric arc-welded steel

truss four-point suspension type.

This propeller is available in all Hartzell models, including Extension Shaft, Cool Blast, Industrial Stand, Utility and Pulley Drive. Sizes in which each model is regularly available are listed by symbols in the last column to the right on the next page. Special mountings and sizes built to order at reasonable cost. Refer to Index for standard model illustrations.

Charavay Single-Propeller Standard Fan

Guaranteed Standard Test Code Ratings

Catalog No.	H. P. of Motor	Speed R.P.M.	Code Rating C.F.M.	Cubic Feet Per Minute vs. Static Pressure (For Duct Inst.)								App. Ship. Wt. Lbs.	Also Available	
				.05"	.10"	.15"	.20"	.25"	.30"	.40"	.50"			.75"
H12	1/50	1600	#635										20	
H16	1/20	1725	1700	1375	750								45	* zy
H19	1/4	1725	3600	3225	2750	1975							60	* zy
H20	1/20	1725	2600	2400	1700								48	* zyu
H24	1/4	1725	5150	4800	4350	3850	3250	2400					75	* xzyu
H24A	1/6	1125	4000	3400	2800	1250							75	* xzy
H26A	1/6	1125	5200	4300	3250								80	* xzy
H26B	1/4	1725	6250	5700	5150	4500	3750	2800					80	* xzy
H28	1/4	1725	6400	5800	5150	4500	3700	1500					80	* xzyu
H28A	1/6	1125	5400	4600	3750	2250							80	* xzy
H31	1/4	1125	8450	7550	6250	4600							119	* xz u
H31A	1	1725	12850		11500		9900	9100	8200	6000			155	* xz u
H36	1/4	1125	9600	8600	7150	5350							140	* xz u
H36A	1	1725	14500		13250		11800	11000	10000	7500			175	* xz u
H44	5	1725	32500		31250		30250	29500	27000	26500	22500		360	* xz
H49	5	1725	38000		36500		34000	33000	32000	30000	27000		425	* xz
H55	3	1125	36000		33000		30000	27500	26000	21000			463	* xz
H55A	5	1125	40500		37500		34000	32000	30000	25000			505	* xz
H55B	7-1/2	1725	48500		46000		43000	41500	40000	37000	33500		520	* xz
H55D	10	1725	53000		51000		48500	47000	46000	43000	40000	26500	670	* xz
25 Cycle														
H16C	1/20	1425	2000	1500	750								45	* zy
H20C	1/20	1425	2510	2075	1200								48	* zyu
H24C	1/8	1425	4200	3650	3100	2400							70	* xzyu
H26C	1/4	1425	6500	5900	4850	3900	2850						75	* xzy
H28C	1/4	1425	6650	6150	5250	4450	3450						80	* xzyu
H31C	1	1425	12500		11100		8500	7000	5200				160	* xz
H36C	1/2	1425	11750		10400	8000	6000						132	* xz u
H36AC	1	1425	13600		12000	10900	9500	7000					170	* xz u
H44C	3	1425	27000		26000		23500	21750	20000	16750	13500		445	* xz
H49C	3	1425	32000		30000		27500	25500	24000	20000	13500		450	* xz
H55C	5	1425	42500		40000		37000	35500	34000	29000	22500		505	* xz

*—Extension Shaft Model Also Available. See page 14.

x—Cool Blast Model Also Available. See page 17.

z—Pulley Drive Model Also Available. See page 15.

y—Industrial Stand Model Also Available. See page 16.

u—Utility Model Also Available. See page 16.

#—Anemometer Reading.

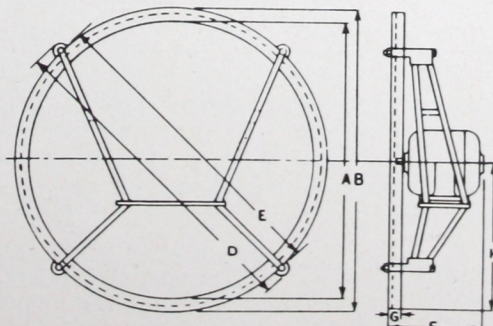
Principal Dimensions

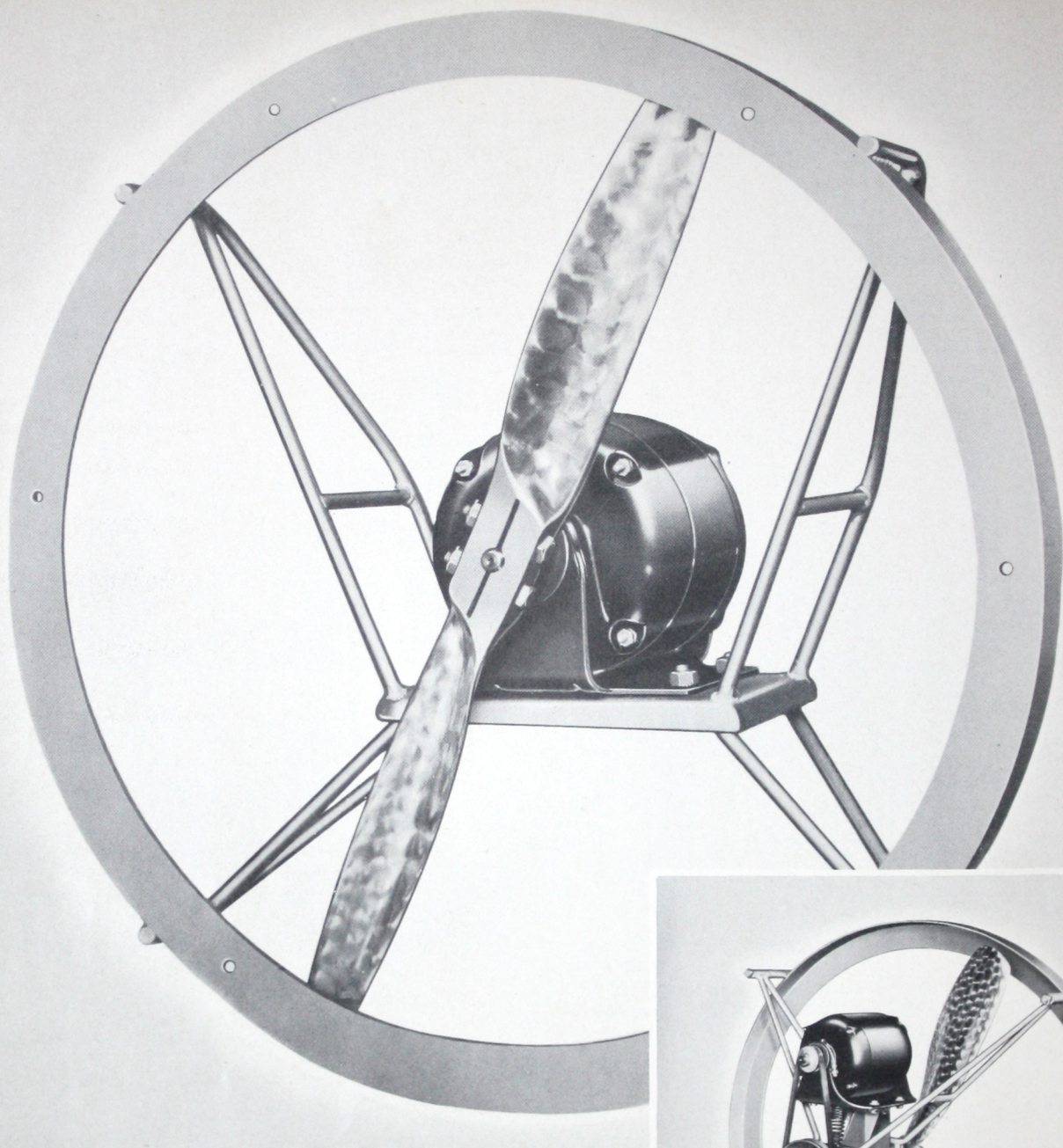
Cat. No.	12	16	17	19	20	24	26	28	31	36	44	49	55
A	12	16	17	19	20	24	26	28	31	36	44	49	55
B	13 3/4	18 3/4	19 3/4	21 3/4	22 3/4	27 1/2	29	32	36	41	49	56	62
D	14 1/2	19 1/2	20 1/2	22 1/2	23 1/2	28 3/8	29 3/4	33	37 1/2	43	51	58	64
†E									36 3/4	42	50	57	63
†F	7 1/2	11 1/4	11 1/4	12	12	12	10 1/2	10 1/2	14 1/2	14 1/2	17	18 1/2	20
G	7/8	7/8	7/8	7/8	7/8	1 3/4	1 1/2	1 1/2	2	2	2 1/2	3	3
H	6 7/8	9 3/8	9 3/8	10 7/8	11 3/8	13 3/4	14 7/8	16	18	20 1/2	24 1/2	28	31

† No through bolts where no figures are shown; motor support rods are welded to ring.

Note: E equals diameter of mounting bolt circle.

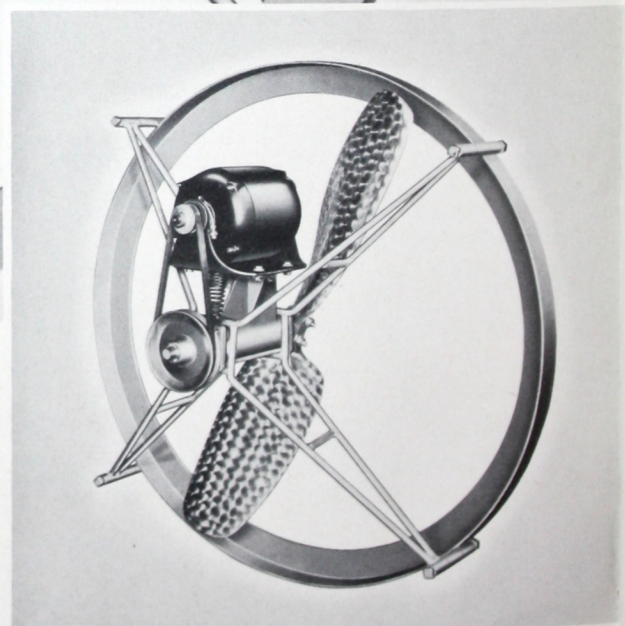
Varies for different motor sizes.





QUIET!

The New Charavay "Tear-Drop" Fan
(PATENT APP. FOR)



SLOW SPEED
The New "Tear-Drop"
Belt Drive Fan
(PATENT APP. FOR)

This
appl
back
of a
out t
treat

The

Cata No
T12
T20
T22
T24
T28
T31
T36
T40
T44
T28
T36

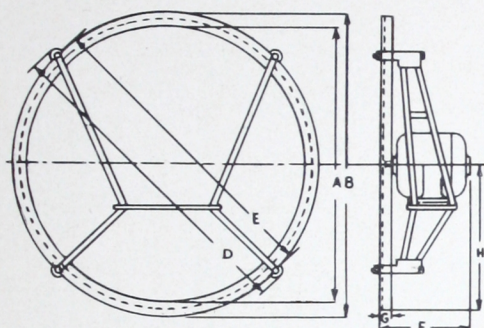
*-E
x-C
z-P

VEN

The New Charavay "Tear-Drop" Fan

(PATENT APP. FOR)

This new Charavay propeller involves a totally new application of aerodynamics, the air foil section, or back of the blade, being designed to allow the use of a sweeping curve on the face of the propeller without the turbulence of air which normally follows this treatment. The result is an amazingly quiet fan with



Principal Dimensions:

Cat. No.	12	20	22	24	28	31	36	40	44
A	12	20	22	24	28	31	36	40	44
B	13 $\frac{3}{4}$	22 $\frac{3}{4}$	24 $\frac{5}{8}$	27 $\frac{1}{2}$	32	36	41	45	49
D	14 $\frac{1}{2}$	23 $\frac{1}{2}$	25 $\frac{3}{8}$	28 $\frac{3}{8}$	33	37 $\frac{1}{2}$	43	47	51
†E						36 $\frac{3}{4}$	42	46	50
‡F	7 $\frac{1}{2}$	12	12	12	10 $\frac{1}{2}$	14 $\frac{1}{2}$	14 $\frac{1}{2}$	15	17
G	7 $\frac{1}{8}$	7 $\frac{1}{8}$	1	1 $\frac{3}{4}$	1 $\frac{1}{2}$	2	2	2 $\frac{1}{2}$	2 $\frac{1}{2}$
H	6 $\frac{7}{8}$	11 $\frac{3}{8}$	12-5/16	13 $\frac{3}{4}$	16	18	20 $\frac{1}{2}$	22 $\frac{1}{2}$	24 $\frac{1}{2}$

† No through bolts where no figures shown; motor support rods are welded to ring.

‡ Varies for different motor sizes.

Note: E equals diameter of mounting bolt circle.

THESE DIMENSIONS APPLY ONLY TO DIRECT-DRIVE FANS, NOT TO BELT-DRIVEN.

full air delivery which holds up against back-pressure better than any previous single-propeller design.

This propeller is regularly available in the standard mounting shown, and also in Extension Shaft, Cool Blast and Pulley Drive models. The sizes in which these are available are indicated by symbols in the last column in the Rating Table below. The Tear-Drop propeller can also be supplied on special order with Industrial Stand Model and Utility mountings. Refer to Index (Page 1) for pages on which all models are illustrated.

SLOW SPEED! The Belt Drive "Tear-Drop"

(PATENT APP. FOR)

In appearance, this fan is characterized by a wide, sweeping propeller. Being belt driven, it operates at very slow speeds, radically reducing the production of sound. Motor mounting, newly designed by Hartzell engineers, provides for automatically maintained belt tension through motor balance and positive spring pressure. Two sets of self-aligning and felt sealed ball bearings insure a smooth running shaft and prevent any possibility of binding. This is the first really efficient slow-speed belt driven propeller-type fan to be produced.

The New Charavay Tear-Drop Fan

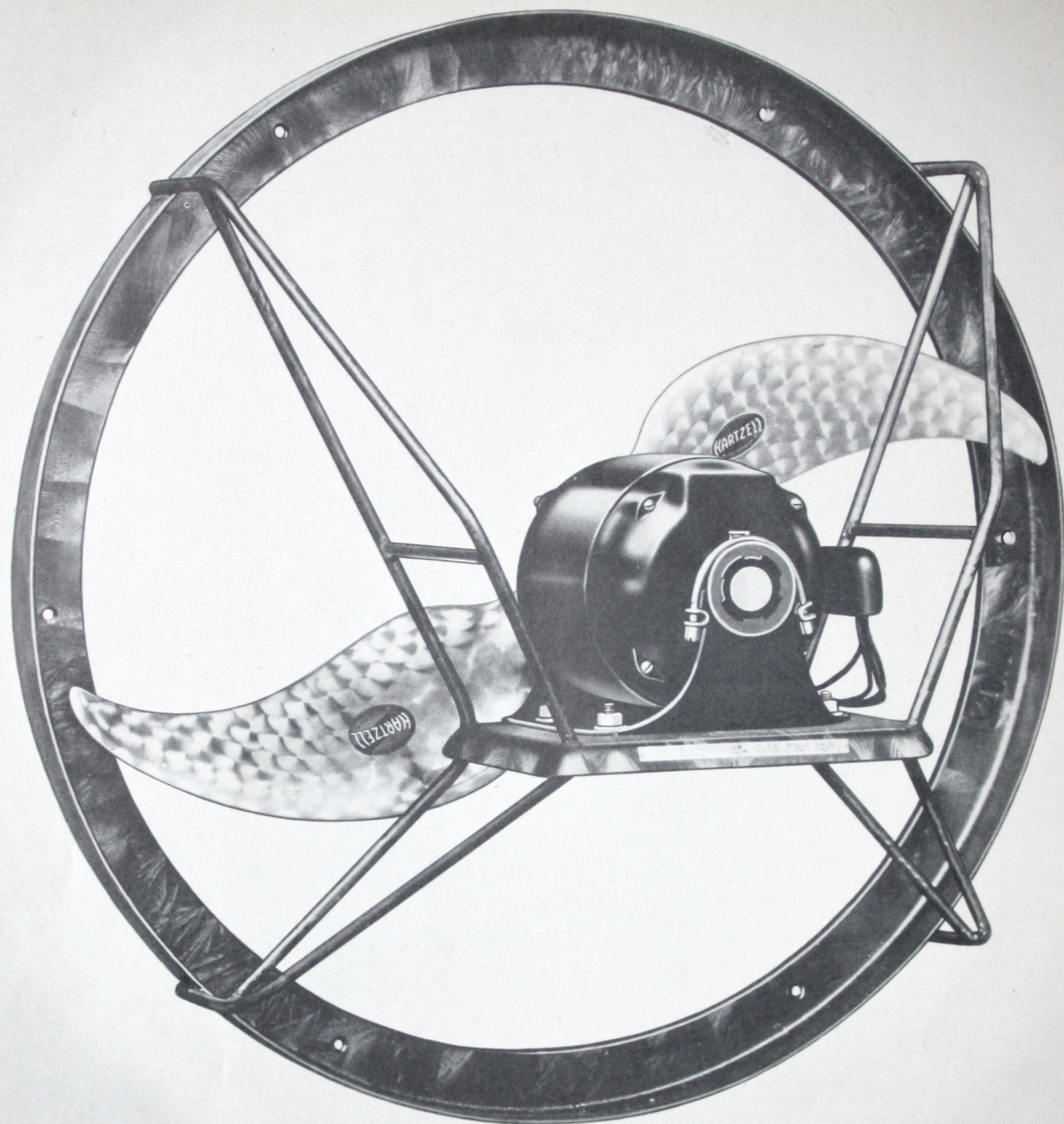
Guaranteed Standard Test Code Ratings

Catalog No.	H. P. of Motor	Speed R.P.M.	Code Rating C.F.M.	Cubic Feet Per Minute vs. Static Pressure (For Duct Inst.)								App. Ship. Wt. Lbs.	Also Available
				.05"	.10"	.15"	.20"	.25"	.30"	.40"	.50"		
T12	1/20	1725	1200	1050	900							45	
T20	1/20	1125	2400	1900	1000							48	*
T22	1/4	1725	5000	4700	4400	4000	3600	3050				70	*
T24	1/4	1125	5100	4550	4000	3250						75	*XZ
T24A	1/4	1725	5600	5200	4750	4250	3750	3150				75	*XZ
T28	1/3	1125	7400	6850	6150	5400	4400					80	*XZ
T31	1/2	1125	9200	8500	7700	7150	6350	5300				119	*XZ
T36	1	1125	14100	13450	12800	12100	11350	10500	9550			140	*XZ
T40	2	1125	20600	20000	19300	18700	17800	17000				340	*XZ
T44	3	1125	26000	25300	24000	23600	22800	22000	21100	19300	17200	360	*XZ
Belt Driven Models													
T28BDS	1/4	780	6520	5850	5250	4450	2000					90	
T36BDS	1/3	600	10000	9100	7850	6200	2750					150	

*—Extension Shaft Model Also Available. See page 14.

x—Cool Blast Model Also Available. See page 17.

z—Pulley Drive Model Also Available. See page 15.



QUIET!

The Charavay "Birdwing" Fan (PATENTED)

Three years of experimentation throughout the propeller fan industry have produced no propeller-type air moving equipment which surpasses the Birdwing fan in its ability to operate quietly without the slightest loss in volume of air moved. This propeller incorporates the aerodynamic principles which give the standard Hartzell propeller its efficiency, but is designed in such a way as to reduce the production of noise to a new low point in propeller fan history.

This propeller is regularly available in the standard mounting shown above, and also in Extension Shaft, Cool Blast and Pulley Drive models. The sizes in which these are available are indicated by symbols in the last column in the Rating Table on the next page. The Birdwing propeller can also be supplied on special order with Industrial Stand Model and Utility mountings. Birdwing Air Circulators are shown on Page 19. Refer to Index (Page 1) for pages on which all models are illustrated.

Charavay Birdwing Single and Two Propeller Fans

Guaranteed Standard Test Code Ratings

Catalog No.	H. P. of Motor	Speed R.P.M.	Code Rating C.F.M.	Cubic Feet Per Minute vs. Static Pressure (For Duct Inst.)								App. Ship. Wt. Lbs.	Also Available
				.05"	.10"	.15"	.20"	.25"	.30"	.40"	.50"		
Q12	1/50	1590	635	375								20	
Q17	1/20	1725	1950	1500	1100	700						42	*
Q17A	1/20	1125	1800									47	*
Q17B	1/10	1725	2100	1800	1520	1200						45	*
Q17B3	1/10	1725	2100	1800	1520	1200						45	*
		1400	1700										
		1100	1300										
Q20	1/10	1125	2700	2250	1400							60	*
Q24	1/6	1125	4600	4000	3400	1500						70	*XZ
Q24A	1/4	1725	5500	5100	4600	4050	3300					70	*XZ
Q24T	1/6	1125	4600	4000	3400	1500						70	*XZ
		700	3500										
Q24-3	1/6	1125	4600	4000	3400	1500						90	*XZ
		800	3500										
		700	2800										
Q26	1/4	1725	6300	5700	5100	4400	3400					90	*XZ
Q26-2A	1/2	1725	7500	7150	6800	6400	6000	5600	5100			155	*XZ
Q28	1/6	1125	5550	5000	4250	2500						85	*XZ
Q28A	1/2	1125	7150	7000	6700	6150	5250	3000	2200			115	*XZ
Q28A3	1/6	1125	5550	5000	4250	2500						100	*XZ
		800	4150										
		700	3450										
Q28B	1/3	1725	6650	6000	5300	4700	3700	2000				85	*XZ
Q28-3	1/3	1725	6650	6000	5300	4700	3700	2000				85	*XZ
		1400	5500										
		1100	4250										
25 Cycle													
Q17C	1/20	1425	1740	1360	900	500						45	*
Q24C	1/4	1425	5300	4750	4100	3450	2750	1750				70	*XZ
Q28C	1/3	1425	7000	6250	5550	4600	3750	2700	1200			90	*XZ

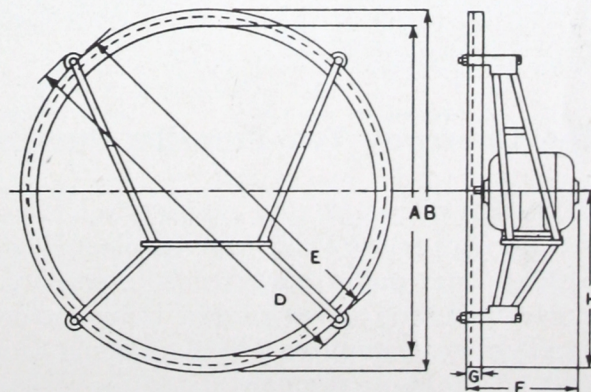
*—Extension Shaft Model Also Available. See page 14.

x—Cool Blast Model Also Available. See page 17.

z—Pulley Drive Model Also Available. See page 15.

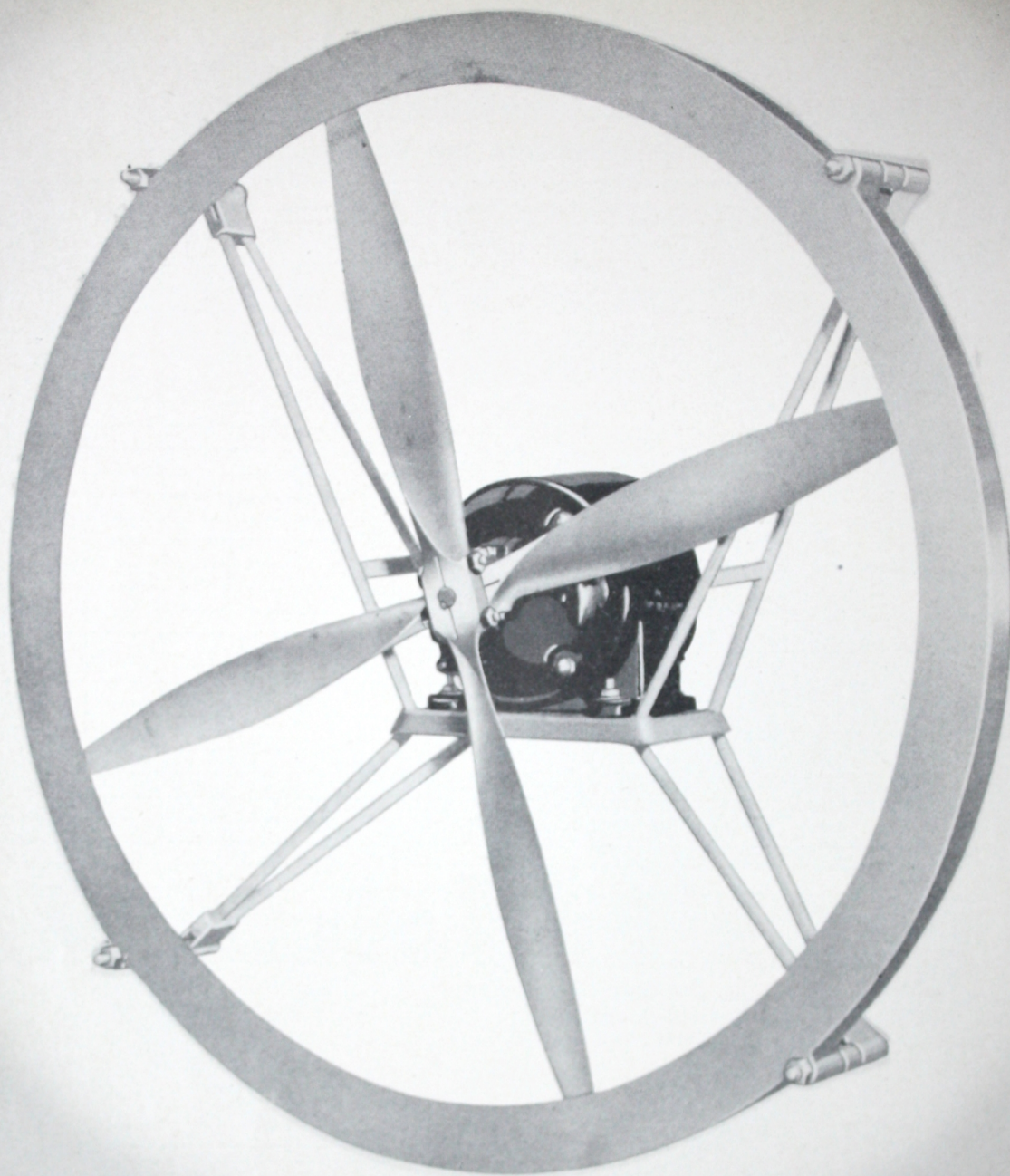
Principal Dimensions

Cat. No.	12	16	17	19	20	24	26	28
A	12	16	17	19	20	24	26	28
B	13 3/4	18 3/4	19 3/4	21 3/4	22 3/4	27 1/2	29	32
D	14 1/2	19 1/2	20 1/2	22 1/2	23 1/2	28 3/8	29 3/4	33
†E	7 1/2	11 1/4	11 1/4	12	12	12	10 1/2	10 1/2
†F	7/8	7/8	7/8	7/8	7/8	1 3/4	1 1/2	1 1/2
G	6 7/8	9 3/8	9 7/8	10 7/8	11 3/8	13 3/4	14 7/8	16
H								



† No through bolts where no figures are shown; motor support rods are welded to ring.
Note: E equals diameter of mounting bolt circle.

‡ Varies for different motor sizes.



The Charavay Two-Propeller Standard Fan

Perfection of design and precision of manufacture characterize this fan. Its electric arc-welded four-point suspension steel truss motor mounting gives almost indestructible strength and minimizes vibration, at the same time presenting extremely slight interference to air flow. As in all Hartzell fans, the patented Charavay Overlapping Ring prevents the back-flow of air, increasing effective air delivery by 20% or more in every size.

This propeller is regularly available on the Extension Shaft, Cool Blast and Pulley Drive models, as well as in the standard mounting shown above. Sizes in which each is made are shown by symbols in the right column of the Rating Table on the next page. It can be supplied on special order in sizes other than standard in these models, and also on the Industrial Stand Model and Utility fan. Refer to Index (Page 1) for illustrations.

Charavay Two-Propeller Standard Fan

Guaranteed Standard Test Code Ratings

Catalog No.	H. P. of Motor	Speed R.P.M.	Code Rating C.F.M.	Cubic Feet Per Minute vs. Static Pressure (For Duct Inst.)											App. Ship. Wt. Lbs.	Also Available
				.05"	.10"	.15"	.20"	.25"	.30"	.40"	.50"	.75"	1.00"	1.25"		
H16-2A	1/10	1725	2400	2100	1800	1200									65	* z
H20-2A	1/10	1725	3000	2775	2525	2225	1900								49	* z
H24-2	1/6	1125	4300	3850	3350	2800									81	* xz
H24-2A	1/2	1725	6450	6250	5950	5600	5300	4850	4550	3500					100	* xz
H26-2	1/3	1125	6700	6250	5750	5150	4250	2500							100	* xz
H26-2A	1/2	1725	7400	7100	6750	6300	5900	5450	4900						100	* xz
H28-2	1/3	1125	7550	7000	6500	5950	5150	4000							105	* xz
H28-2A	1/2	1725	7900	7650	7250	6750	6200	5750	5000	3250					105	* xz
H31-2	1/2	1125	9700	8750	7900	7200	6450	5500	3500						150	* xz
H31-2A	1	1125	12800	12250	11850	11400	10800	10000	9000	5500					220	* xz
H31-2B	2	1725	15500	15250	15000	14650	14200	13750	13300	12000	10000				195	* xz
H36-2	1/2	1125	12100		10400		8400	7200	5500						161	* xz
H36-2A	1	1125	13600		12200		10700	9700	8500						183	* xz
H36-2B	2	1725	17000		16300		15300	14700	14100	12700	10700				188	* xz
H44-2	2	1125	25700		23500		21250	19500	18500	15750	12500				300	* xz
H44-2A	3	1125	26000		24600		22900	22000	21000	19000	16000				310	* xz
H44-2B	7-1/2	1725	38500		37250		36000	35250	34750	33500	31750				430	* xz
H49-2	10	1725	48500		47500		46000	45500	45000	43500	42000	36000	29000	28250	550	* xz
H55-2	3	850	34000		31500		27500	25000	22500						505	* xz
25 Cycle																
H20-2C	1/10	1425	3000	2750	2500	2250	1800								50	* z
H24-2C	1/3	1425	5350	5050	4600	3400	3000								75	* xz
H26-2C	1/2	1425	7400	7100	6750	6300	5900	5450	4900						95	* xz
H28-2C	1/2	1425	8350	8000	7500	6900	6450	5850	5250						100	* xz
H31-2C	3/4	1425	11650	10900	10400	10000	9500	9000	8100						188	* xz
H31-2AC	1	1425	12700	12250	11850	11400	10800	10000	9000	5500					220	* xz
H36-2AC	1	1425	14250		13300		12000	11300	10400	8400	6500				230	* xz
H44-2C	5	1425	32500		31000		28750	28000	27250	25250	23250	17000			470	* xz
H49-2C	7-1/2	1425	40000		38000		36000	35000	33500	31500	29000				650	* xz
H55-2C	10	1425	53000		51000		49000	47500	46500	44000	41000	31000			830	* xz

* —Extension Shaft Model Also Available. See page 14.

x—Cool Blast Model Also Available. See page 17.

z—Pulley Drive Model Also Available. See page 15.

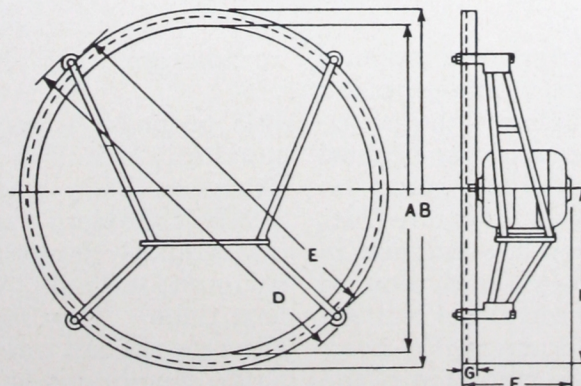
Principal Dimensions

Cat. No.	12	16	17	19	20	24	26	28	31	36	44	49	55
A	12	16	17	19	20	24	26	28	31	36	44	49	55
B	13 3/4	18 3/4	19 3/4	21 3/4	22 3/4	27 1/2	29	32	36	41	49	56	62
D	14 1/2	19 1/2	20 1/2	22 1/2	23 1/2	28 3/8	29 3/4	33	37 1/2	43	51	58	64
†E									36 3/4	42	50	57	63
‡F	7 1/2	11 1/4	11 1/4	12	12	12	10 1/2	10 1/2	14 1/2	14 1/2	17	18 1/2	20
G	7/8	7/8	7/8	7/8	7/8	1 3/4	1 1/2	1 1/2	2	2	2 1/2	3	3
H	6 7/8	9 3/8	9 7/8	10 7/8	11 3/8	13 3/4	14 7/8	16	18	20 1/2	24 1/2	28	31

† No through bolts where no figures are shown; motor support rods are welded to ring.

Note: E equals diameter of mounting bolt circle.

‡ Varies for different motor sizes.





The Charavay Multiblade Standard Fan

This fan, identical in design and general construction to the standard single-propeller and two-propeller fans, delivers the maximum volume of air per horsepower against back-pressure. Blades are staggered to avoid built-up "air reverberation." Truss type motor mounting gives strength far in excess of any possible need, and reduces vibration. Neither this nor any other Hartzell propeller-type fan can be damaged by overloading, including complete stoppage of the

air passage.

This propeller is regularly available in the standard mounting shown above, and in Extension Shaft and Pulley Drive models. Symbols showing sizes in which these models are regularly furnished are listed in the last column to the right in the Rating Table on the next page. Other mountings and sizes supplied on special order. Refer to Index (Page 1) for illustrations of various models.

Charavay Multiblade Standard Fan

Guaranteed Standard Test Code Ratings

Catalog No.	H. P. of Motor	Speed R.P.M.	Code Rating C.F.M.	Cubic Feet Per Minute vs. Static Pressure (For Duct Inst.)											App. Ship. Wt. Lbs.	Also Available
				.05"	.10"	.15"	.20"	.25"	.30"	.40"	.50"	.75"	1.00"	1.25"		
H12M	1/20	1725	1200	1080	880										35	
H12MA	1/4	3425	1950	1900	1870	1800	1725	1675							50	
H17M	1/4	1725	3500	3300	3175	3050	2900	2750	2575	2000					58	*Z
H20M	1/10	850	2560												120	*Z
H20MA	1/6	1125	3200	2950	2530	2000									102	*Z
H20MB	1/2	1725	4900	4800	4375	4500	4300	4050	3500	1750					120	*Z
H20MD	1	1725	6050	5900	5750	5500	5150	4500	3650	3000	2500				135	*Z
H20M3	1/6#	1125	3200	2950	2530	2000									102	*Z
		1080	3050													
		820	2300													
H24M	1	1725	8400	8000	7800	7600	7400	7150	6900	6400	5600				140	*Z
H26M	1/6	850	5020	4700	4150	2650									128	*Z
H26MA	1-1/2	1725	10300	10000	9700	9350	9100	8800	8500	8000	7500	2600			150	*Z
H26M3	1/4	1125	6100	5600	5200	4750	4100	3250							128	*Z
		850	4500													
		700	3800													
25 Cycle																
H12MC	1/20	1425	1200	1020	850										35	
H20MC	1/2	1425	5050	4850	4550	3900	3000	2600	2400						120	*Z

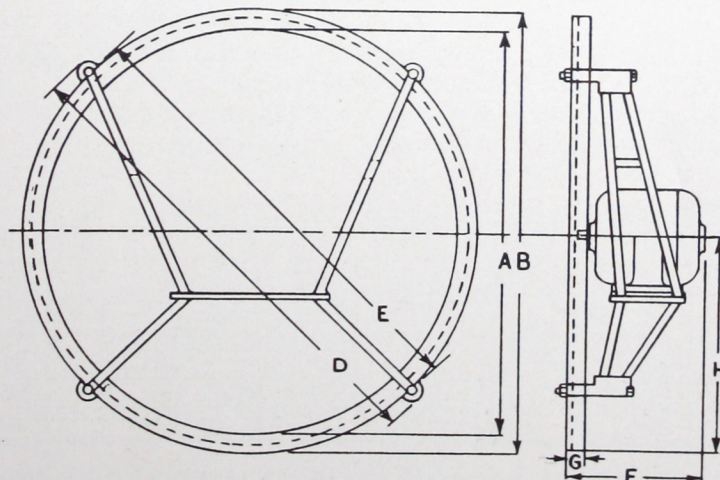
*—Extension Shaft Model Also Available. See page 14.

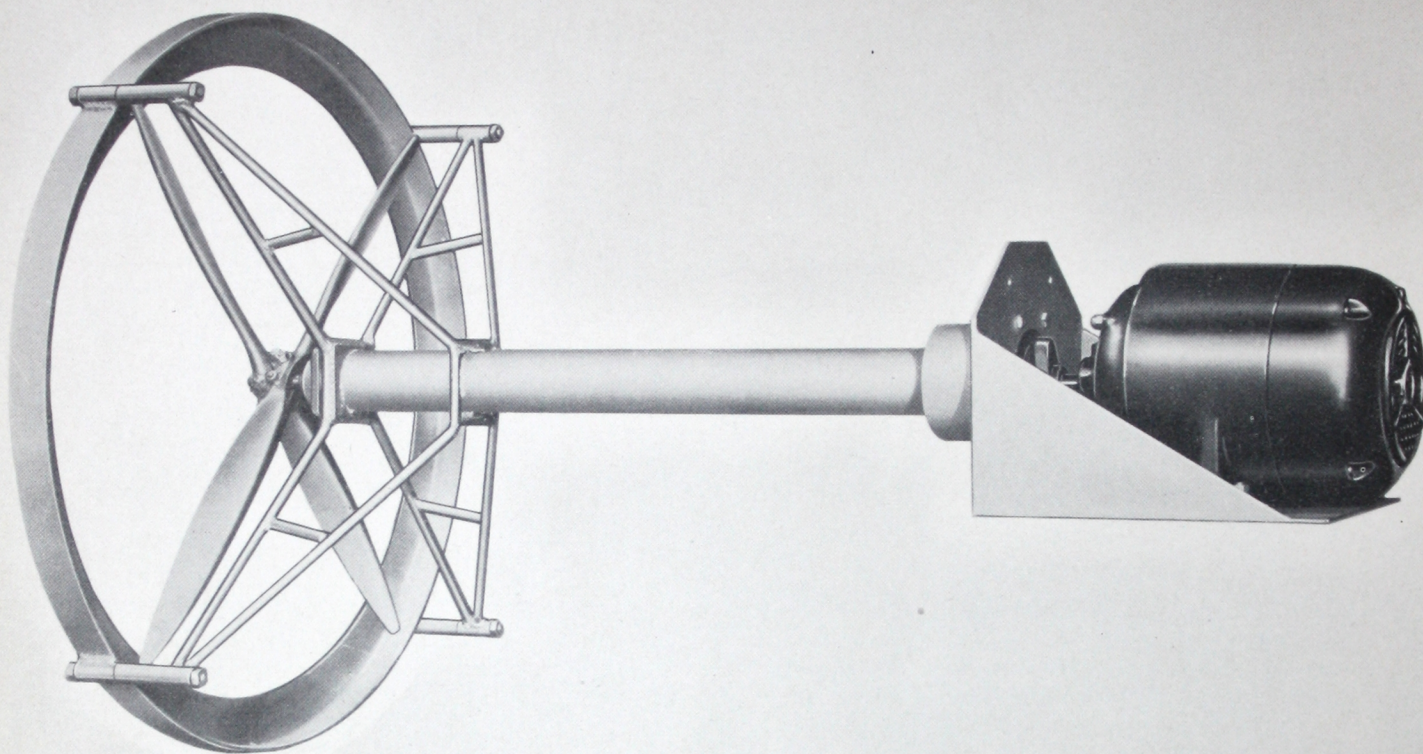
z—Pulley Drive Model Also Available. See page 15.

#—Unit Equipped With Capacitor Motor.

Principal Dimensions

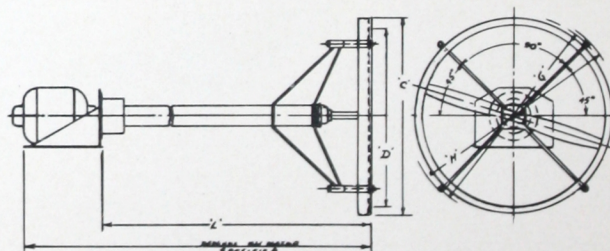
No.	12	17	20	12	20	20	26	26
				1/4 H. P.	1/2 H. P.	1 H. P.	1/6 H. P.	1 1/2 H. P.
A	12	17	20	12	20	20	26	26
B	13 3/4	19 3/4	22 3/4	13	22 1/4	22 1/4	29	29
D	14 1/2	20 1/2	23 1/2	13 1/8	22 1/2	22 1/2	29 1/2	29 1/2
E	12 5/8	18 1/4	20 5/8	11 3/4	20 5/8	20 5/8	27	27
F	7 1/2	11 1/4	12	11	14	15	13 1/2	15 1/2
G	7/8	7/8	7/8	1	1	1	1 3/8	1 3/8
H	6 7/8	9 7/8	11 3/8	7 1/4	11 7/8	11 7/8	15 1/4	15 1/4





The Charavay Extension Shaft Fan

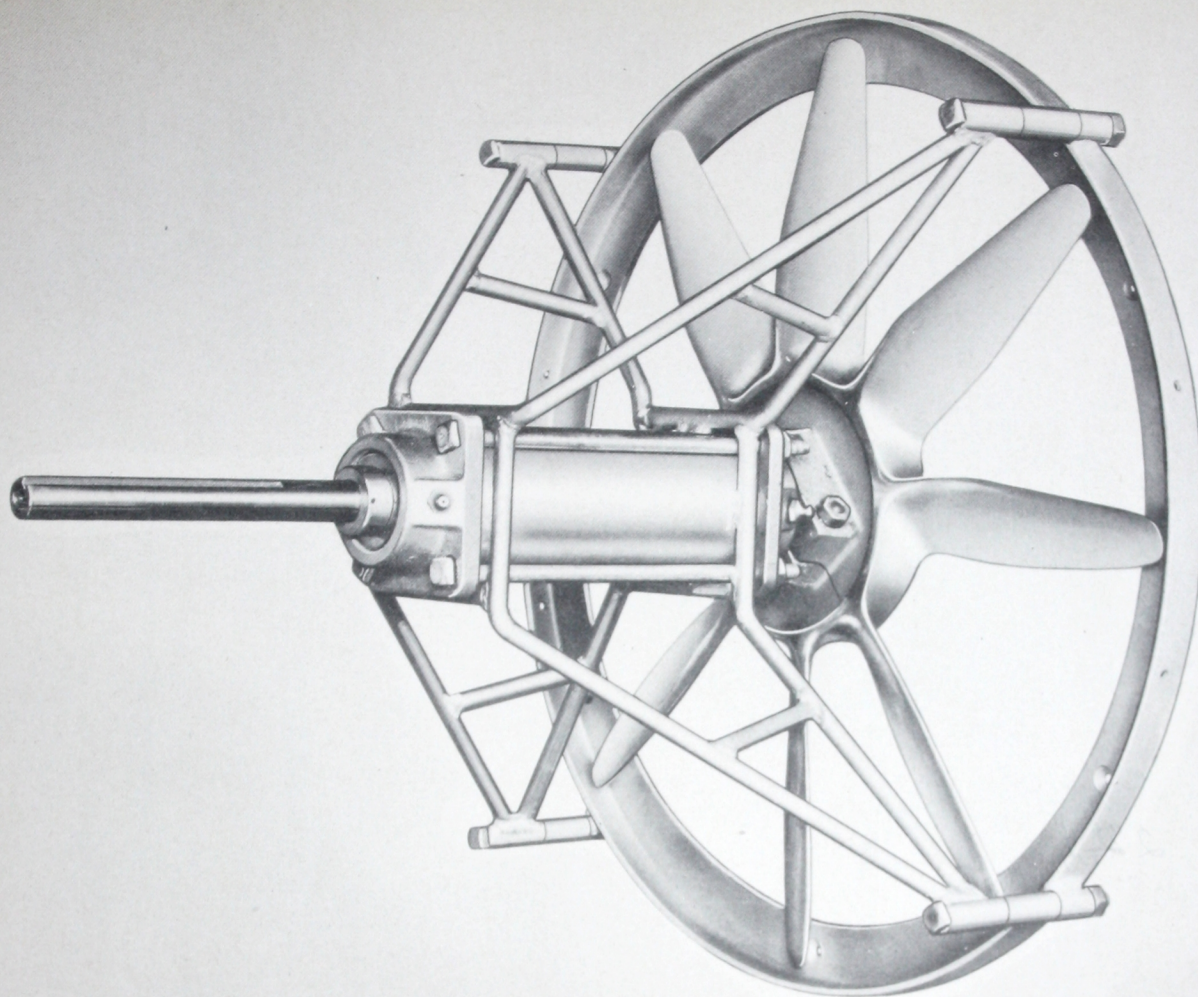
Designed for use where it is desirable to mount the fan with motor outside of a duct through which corrosive elements or excessive abrasive dust passes. This mounting is regularly available with the standard Two-propeller shown above, and with all other Hartzell propellers, including Single-propeller and Multiblade standard, Birdwing and Tear-Drop propellers. Sizes in which each of these propellers is regularly furnished are designated by a symbol (*) in the last column to the right in the Rating Table given with each propeller illustration. Refer to Index (Page 1) for illustrations.



Principal Dimensions:

No.	C	D	G	H	L	No.	C	D	G	H	L
16"	18 3/4"	16"	19 3/8"	20"	20 1/4"	28"	32"	28"	32 5/8"	33 1/4"	29 3/4"
17"	19 3/4"	17"	20 3/8"	21"	20 1/4"	31"	36"	31"	36 3/4"	37 1/2"	30 3/4"
19"	21 3/4"	19"	22 3/8"	23"	21 1/2"	36"	41"	36"	41 3/4"	42 1/2"	35"
20"	22 3/4"	20"	23 3/8"	24"	21 1/2"	44"	49"	44"	50"	51"	50"
24"	27 1/2"	24"	28 1/8"	28 3/4"	29 3/4"	49"	56"	49"	57"	58"	54"
26"	29"	26"	29 5/8"	30 1/4"	29 3/4"	55"	62"	55"	63"	64"	60"

If definite dimensions needed on a particular job factory will furnish print.

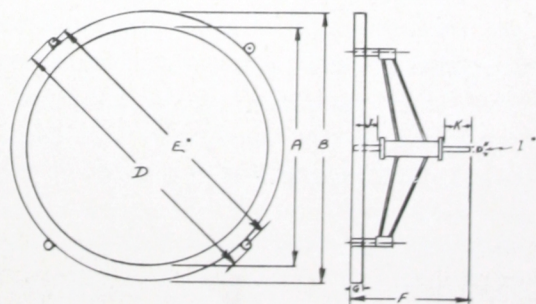


The Charavay Pulley Drive Fan

Furnished without motor or pulley. Steel construction, machined aluminum propellers.

Two sets of self-aligning double felt sealed ball bearings insure a smooth running shaft and prevent any possibility of binding. Alemite lubrication.

This fan, shown with Multiblade propellers, is also regularly available in many sizes equipped with Single and Two-propeller standard, Birdwing and Tear-Drop propellers. Regular sizes are designated by the symbol "Z," in the right hand column of the Rating Table printed with each propeller fan illustration. Other sizes can be supplied on special order.

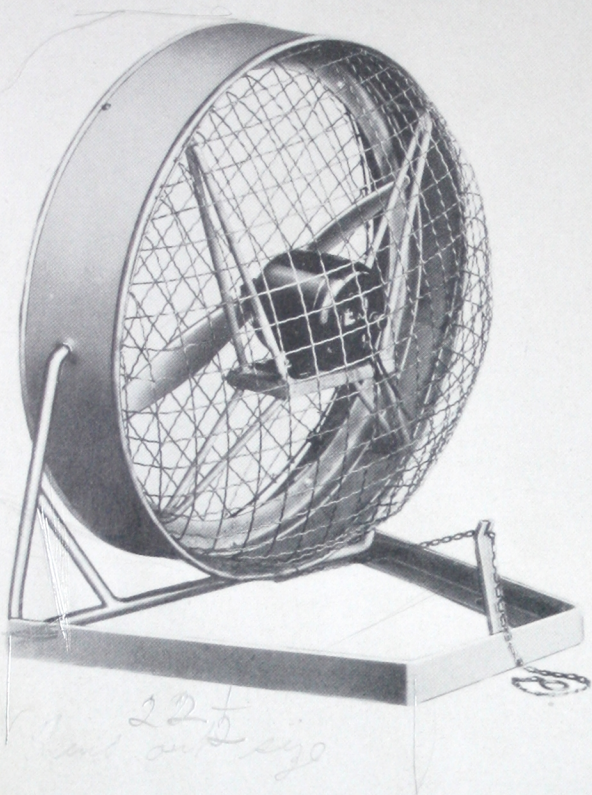


Principal Dimensions:

Size	A	B	D	E*	F	G	I†	J	K
24-2	24	27 1/2	28 3/8	28-15/16	20	1 3/4	1/2	3 1/2	5 1/2
28-2	28	32	33	33-9/16	20	1 1/2	3/4	3 1/2	5 1/2
31-2	31	36	37 1/2	36 3/4	20	2	3/4	3 1/2	5 1/2
36-2	36	41	43	42	20	2	1	3 1/2	5 1/2
44-2	44	49	51	50	24	2 1/2	1 1/4	6	6
49-2	49	56	58	57	24	3	1 1/4	6	6
55-2	55	62	64	63	24	3	1 1/4	6	6

*Diameter of Bolt Circle

†Diameter of Shaft

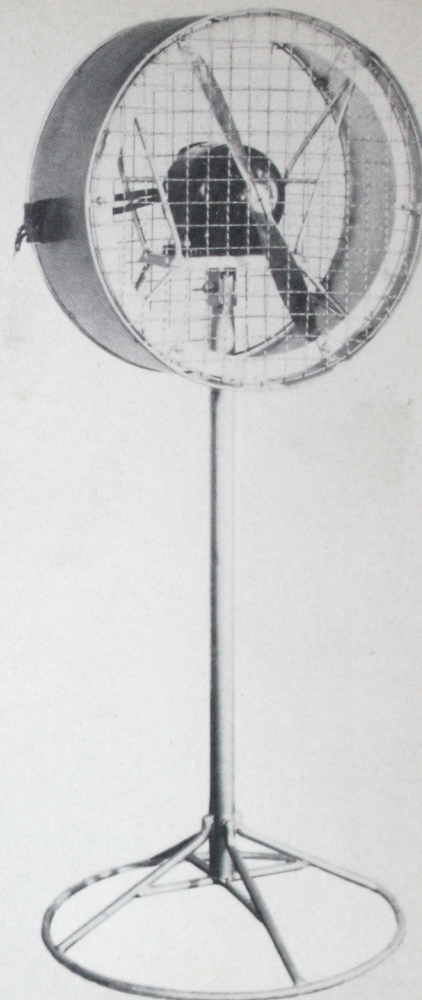


Utility Fan

These fans find many uses in industry, such as the dispersion of heat, cooling and drying of products and dissipation of fumes. They are easily portable, can be plugged in anywhere, and are especially valuable where need shifts from place to place.

Both are constructed of welded rolled steel, cadmium plated, and are equipped with guards guaranteed to pass all safety codes. Both are equipped with the famous Charavay Overlapping Ring.

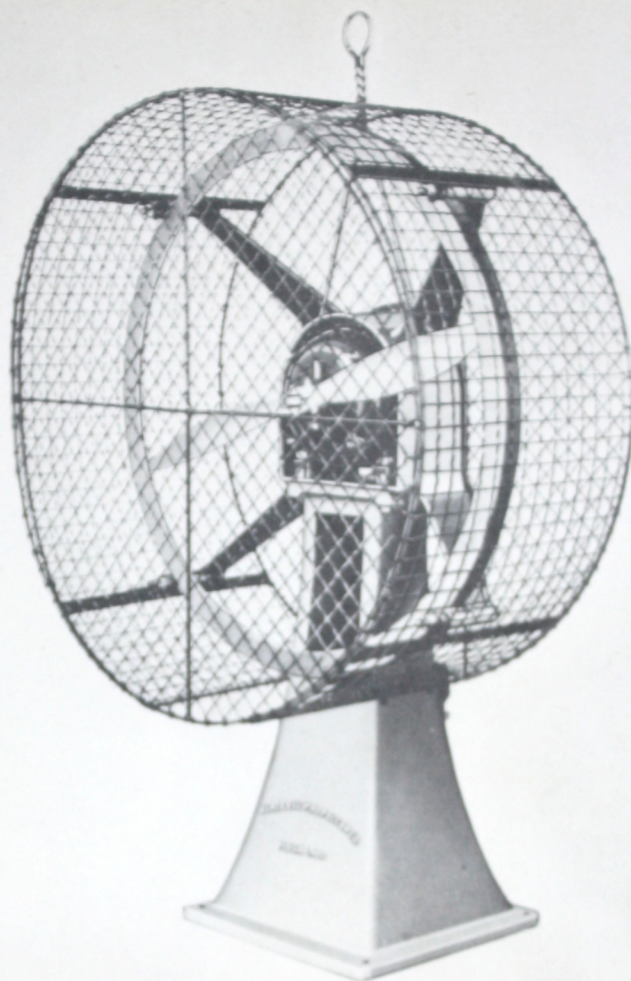
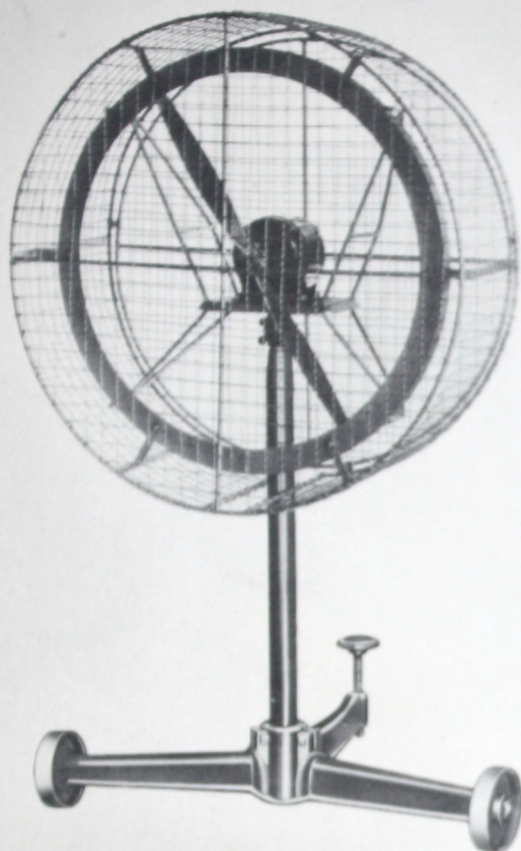
The Utility fan can be completely revolved, vertically, on its stand, and since the stand can be turned in any direction the air stream can be directed as desired without any restriction.



Industrial Stand Model Fan

The Industrial Stand Model can be indexed up or down through a wide arc (but not completely revolved), and therefore meets all practical requirements for direction of air flow.

These fans are regularly available equipped with the standard Single-propeller (shown). Air deliveries and other data are given on Page 5, where standard sizes are indicated by symbols in the right hand column of the Rating Table. "U" designates the Utility fan, "Y" the Industrial Stand Model. Both fans can be supplied on special order in sizes not regularly stocked, and equipped with any Charavay propeller.



The Charavay Cool Blast Fan

The heavy duty Cool Blast fan, made only in 44" size and larger, is designed to be anchored to the floor and used to disperse extreme concentrations of heat or fumes or to cool or dry products quickly. The portable Cool Blast, made in 36" size and smaller, serves the same purposes, and is in addition easily portable.

Both fans are extremely sturdy and are equipped with the famous Charavay Over-

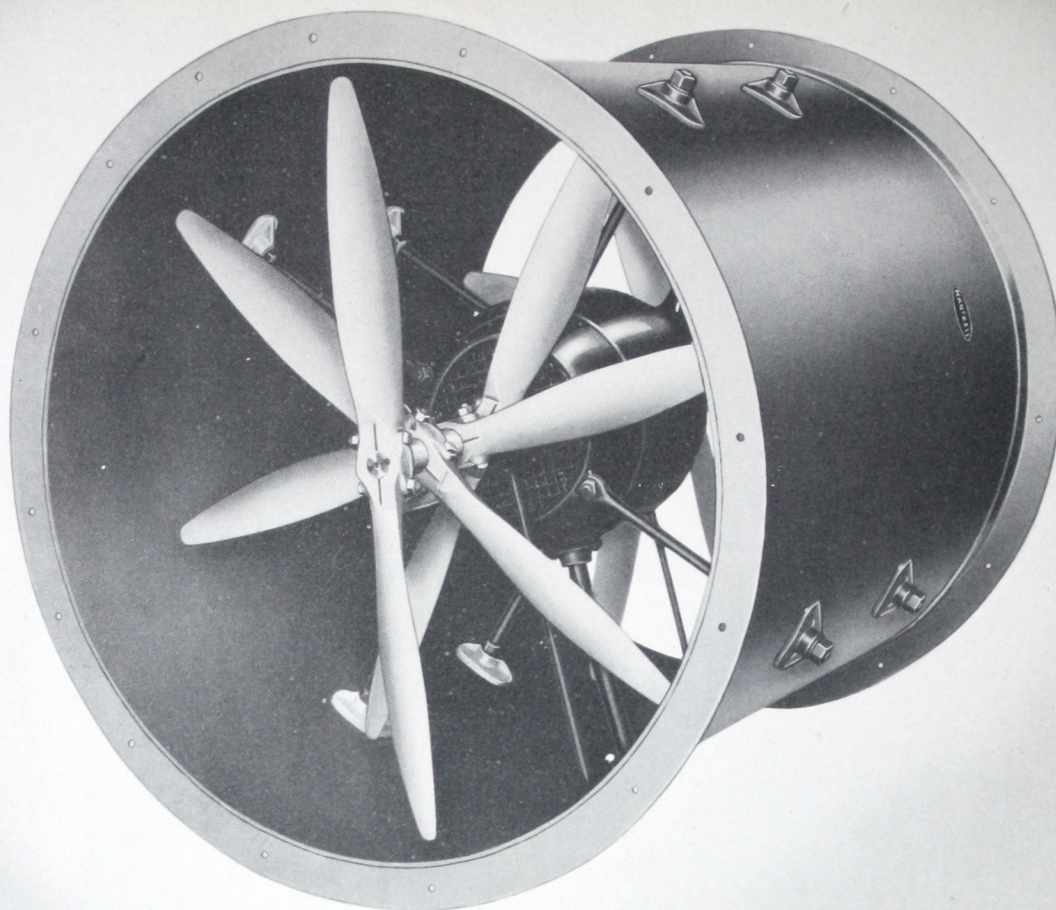
lapping Ring, and with guard guaranteed to meet all safety requirements.

Both are regularly available with the standard Single-propeller shown, and also with Two-propeller standard, Birdwing and Tear-Drop propellers. Regular sizes are designated by the symbol "X," in the right hand column of the Rating Table printed with each propeller fan illustration. Other propellers and sizes can be supplied on special order.

Note: All models are furnished regularly with three point support except 44" and larger.

Note: Height, all numbers H36, and smaller, 48" from center of motor shaft to the floor; adjustable 3" up or down. All

numbers H44 and larger, 54" from center of motor shaft to floor; not adjustable. All numbers H44 and larger, stationary; all others portable.



The Charavay Blower

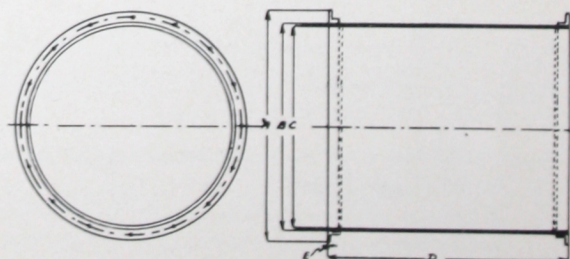
Guaranteed Standard Test Code Ratings

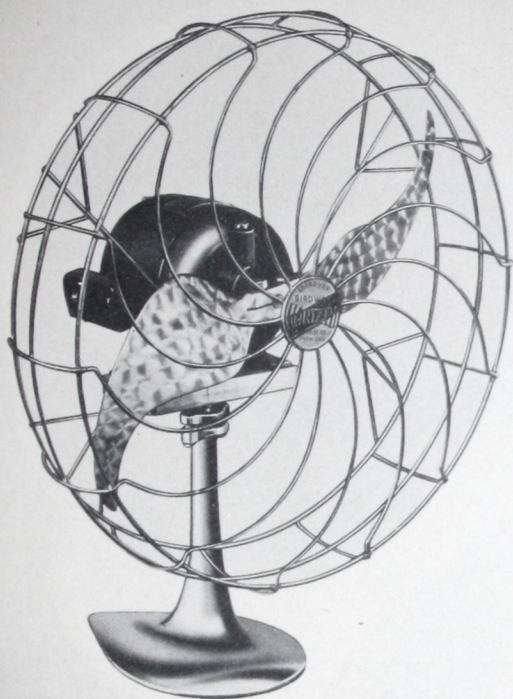
This straight flow blower with propellers mounted screw-fashion in both ends of the unit as shown above, moves a large volume of air against higher pressures with minimum power consumption. It comes to you complete, as shown, insuring trouble-free installation, eliminating much of the work of mounting, costing much less to install. Welded steel construction, machined cast aluminum propellers.

Catalog No.	H. P. of Motor	Speed R.P.M.	Code Rating Free Del'y	Cubic Feet Per Minute vs. Static Pressure										App. Ship. Wt. Lbs.
				.10"	.25"	.50"	.75"	1.00"	2.00"	3.00"	4.00"	5.00"	6.00"	
B18	1/4	1725	3300	3025	2575	1250								95
B18A	3/4	3425	3950	3850	3650	3275	2925	2500	1000					110
B19	7-1/2	3425	7300	7250	7200	7100	6950	6850	6100	4250	2700	1900		387
B24	7-1/2	3425	8750	8700	8600	8300	8100	7900	7000	6250	5350	4450	3500	525
B26	1-1/2	1725	9050	8650	7950	6500	2950							294
B26A	2	1725	9750	9400	8750	7750	6350	2750						294
B26B	3	1725	11000	10700	10200	9350	8250	6800						325
B26D	7-1/2	3425	15100	15000	14800	14600	14200	13800	11600	8100	3700			523
B36	5	1725	22000		21500	19800	18500	17000	10000					572
B36A	7-1/2	1725	28600		27000	25600	24000	22000	11000					582
B42	15	1725	35000		33500	32000	30500	29000	20000	10000				1100
B48	10	1725	40000		37000	34000	31000	28000	16000					874

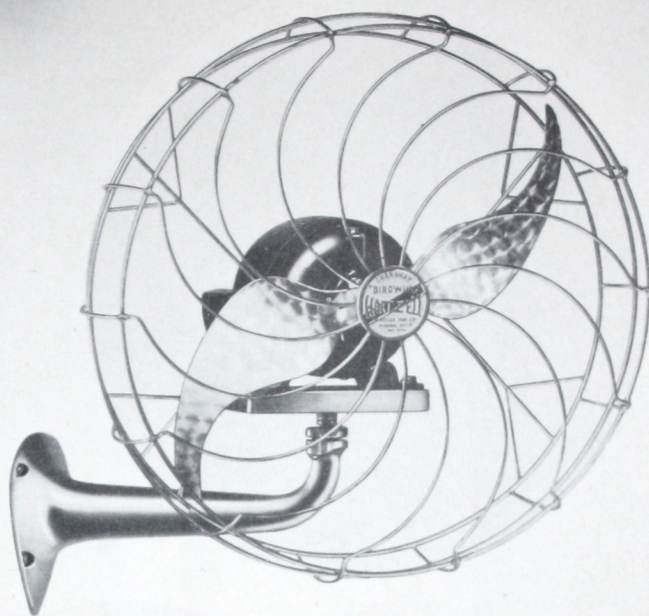
Principal Dimensions

Size	A	B	C	D	E
18	21 1/2	18 3/4	18 1/2	22	1/4
19	22 3/4	19 3/8	19	44	1/4
24	27 1/2	24 3/8	24	44	1/4
26	30	26 1/4	26	44	1/4
36	39	36 1/4	36	44	1/4
42	46 1/2	42 1/4	42	56	1/4
48	51 3/4	48 1/4	48	44	1/4





STAND TYPE



WALL TYPE

Full Charavay Efficiency

New "Birdwing" Quiet

"BIRDWING" AIR CIRCULATORS

This type fan, incorporating all of the advantages of Hartzell engineering plus the proved performance of the Birdwing propeller (patented), is not to be confused with the ordinary air circulator whose only claim to preference over the usual puny desk fan is increased size. This fan, made in both stand and wall type, measures 19" from propeller tip to tip, and moves 1970 cubic feet of air per minute — yet operates so quietly that it is hardly noticeable. It demands the atten-

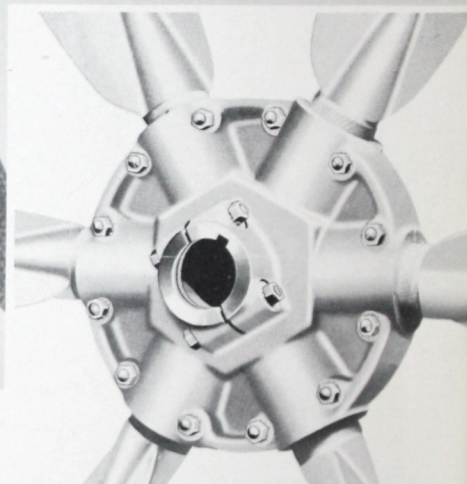
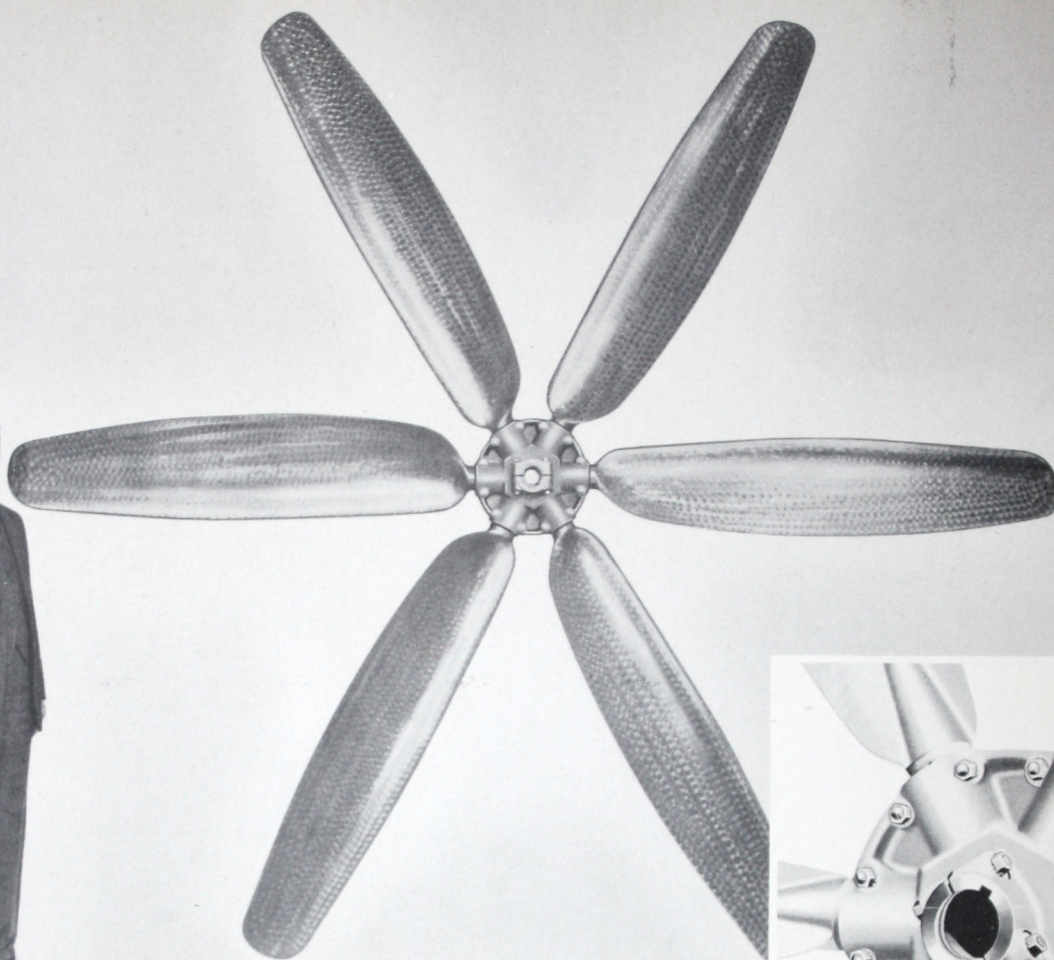
tion of executives who require efficient operation in the office equipment they select.

Quick Facts

Screw-type air motion forces circulation through a very large area. Rubber mountings absorb vibration. Equipped with ball swivel mounting — can be turned in any direction instantly. Motor requires oiling but once every six months. Machined cast aluminum propeller, polished aluminum base, heavy spot welded polished guard — harmonizes with any decorative scheme.

Guaranteed Standard Test Code Ratings

Catalog No.	H. P. of Motor	Speed R.P.M.	Code Rating C.F.M.	App. Ship. Wt. Lbs.
Q19S	1/10	1725	1970	47
Q19W	1/10	1725	1970	47



The Charavay Adjustable Pitch Tear-Drop Fan

Power and flexibility characterize this fan, patented and built exclusively by Hartzell. It brings the Tear-Drop principle to large-size fan construction, and combines it with the proved effectiveness of Hartzell's adjustable pitch feature. Air delivery can be increased at will. This has tremendous advantages in cooling tower and mine use, since it allows adjustment of the

fan to meet varying requirements, obviating the necessity of buying a new fan to meet changed needs. Charavay adjustable pitch Tear-Drop fans operate at slow speed. Their all-aluminum hub and propellers resist corrosion. Installation is simple.

Pitch adjustment is extremely easy. A small wrench is the only tool required.

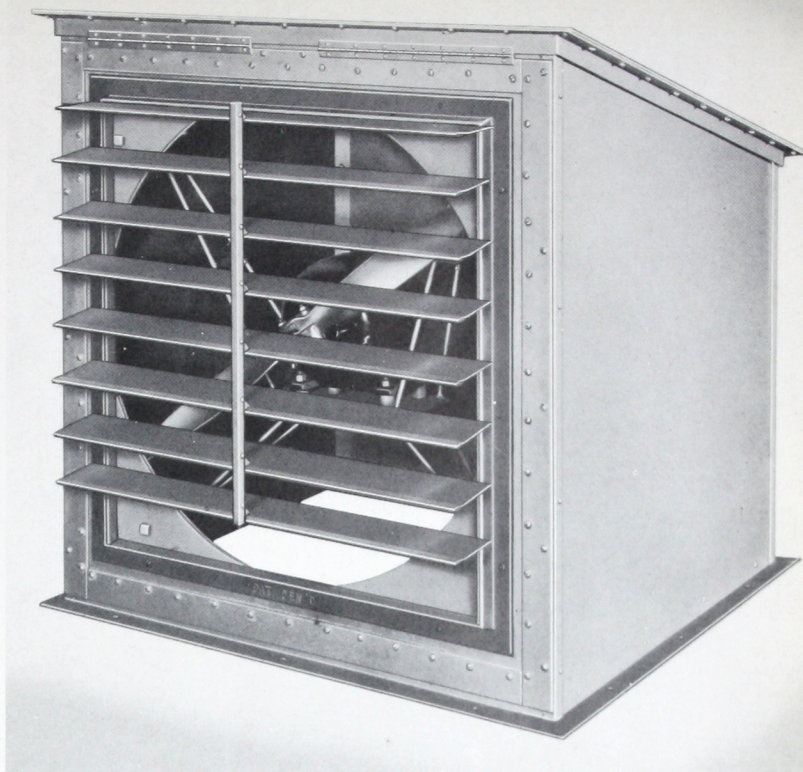
Guaranteed Standard Test Code Ratings (6-Blade Units)

Catalog No.	Cubic Feet per Minute, Revolutions per Minute and Horse Power Requirements											
	¼" Static Pressure			⅜" Static Pressure			½" Static Pressure			¾" Static Pressure		
	C.F.M.	R.P.M.	H.P.	C.F.M.	R.P.M.	H.P.	C.F.M.	R.P.M.	H.P.	C.F.M.	R.P.M.	H.P.
T44-6	14,700	636	1.38	18,000	778	2.54	20,800	900	3.92	25,400	1,100	7.45
T49-6	18,150	572	1.70	22,200	700	3.13	25,700	809	4.83	31,400	990	9.19
T55-6	22,900	510	2.14	28,100	625	3.94	32,400	721	6.08	39,700	884	11.57
T65-6	31,900	424	2.99	39,100	519	5.50	45,100	600	8.50	55,400	734	16.15
T76-6	43,700	360	4.09	53,500	441	7.53	61,750	509	11.60	75,800	624	22.10
T86-6	55,900	319	5.24	68,500	391	9.65	79,000	451	14.89	96,900	542	28.30
T94-6	66,500	297	6.25	81,500	364	11.50	94,000	420	17.75			
T108-6	88,000	255	8.24	108,000	312	15.15	124,200	361	23.40			
T120-6	106,500	232	10.00	130,500	294	18.40	150,500	328	28.40			

Practically the same deliveries can be obtained with 4 or 3 blade units at higher R.P.M.

The Charavay Penthouse

Showing Automatic Shutter Open



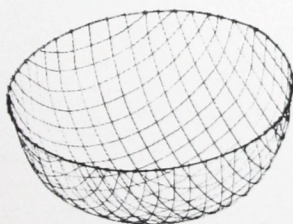
Principal Dimensions of Penthouse

Catalog Size	Front Height	Width	Depth	Base Long	Opening Wide	Approx. Shipping Weight
24	31½	30¾	17¾	30	17¼	130 lbs.
28	37	34¾	21¾	34	21¼	160 lbs.
31	38½	37¾	23¾	37	23¼	190 lbs.
36	44½	43½	26¾	43	26¼	230 lbs.

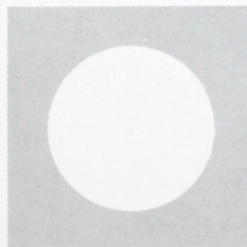
Accessories



Automatic Shutter

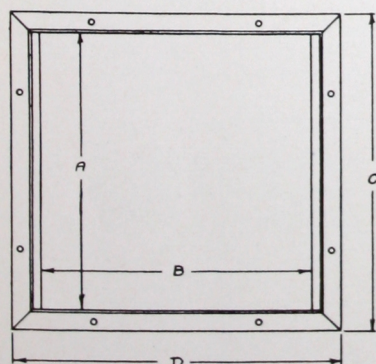


Guard



Panel

Catalog Fan No.	Maximum Size of Panel
12, 16, 17, 19, 20	30" x 30" x 5/8"
24, 26, 28, 31, 36	36" x 36" x 5/8"
	46" x 46" x 5/8"



Principal Dimensions of Automatic Shutters

Cat. Size	A	B	C	D	Cat. Size	A	B	C	D
11-12	12"	12"	14½"	15 "	28	28"	28"	31 "	31½"
15	15"	15"	17½"	18 "	31	31"	31"	34½"	35 "
16-17	17"	17"	19½"	20 "	36	36"	36"	39½"	40 "
19	19"	19"	21½"	22 "	44	44"	44"	47½"	48 "
20	20"	20"	23 "	23½"	49	49"	49"	52½"	53 "
24	24"	24"	27 "	27½"	55	55"	55"	58½"	59 "
26	26"	26"	29 "	29½"					

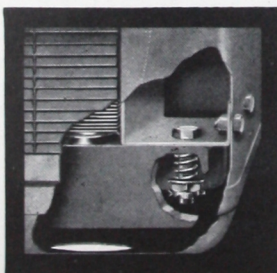


The Hartzell Full Power Unit Heater

The presence or absence of steam in a unit heater makes little difference unless its potential heat is extracted and distributed efficiently. It is obvious that a difference in heater fan efficiency means the same in results. You buy unit heaters for heating. Be sure you get all the heat; be sure the heater distributes heat throughout all the area to be heated.

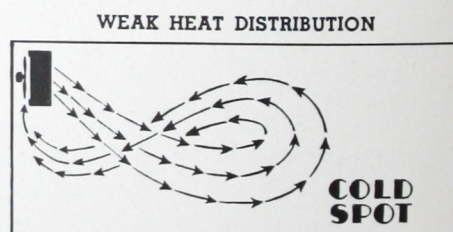
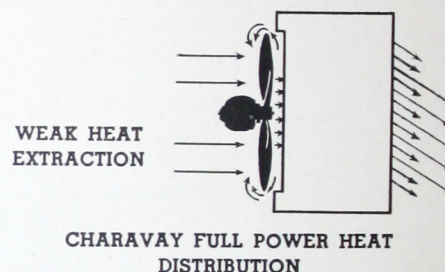
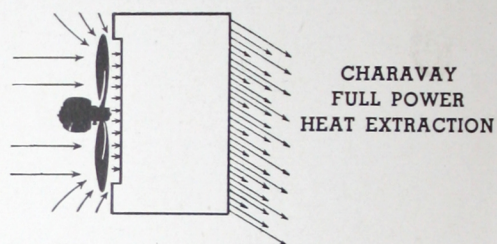
(Send for complete Unit Heater Bulletin)

CHARAVAY FULL FLOATING COIL



To the left is a cutaway view showing the spring suspension Full Floating Coil now incorporated in Hartzell unit heaters. This suspension cushions the coil against external expansion and movements in the pipe line. It protects against the terrific shocks of too-rapid release of steam, and water-hammer. It eliminates loops in tubing, allowing natural expansion in a straight line. In conjunction with the Full Floating Coil, the Charavay Guide Flange removes internal expansion stresses caused by heating and cooling of the coil.

Full Power MEANS Full Value

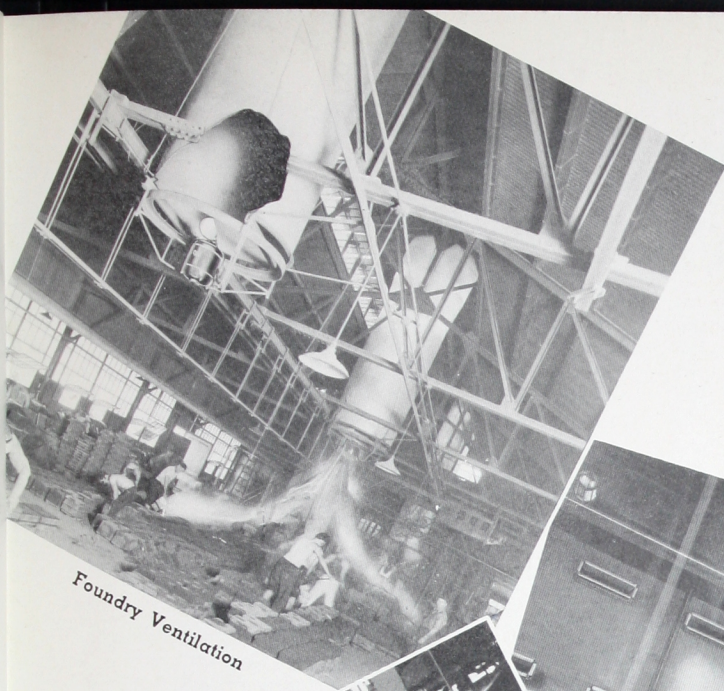


The diagrams above illustrate graphically the difference in performance of a unit heater equipped with the acknowledged superiority of the Charavay fan, with its Charavay Overlapping Ring, and the weakened results of the same heater equipped with an ordinary fan. The extra air delivery afforded by the Charavay fan increases both heat extraction and distribution. Obviously, this is extremely important.

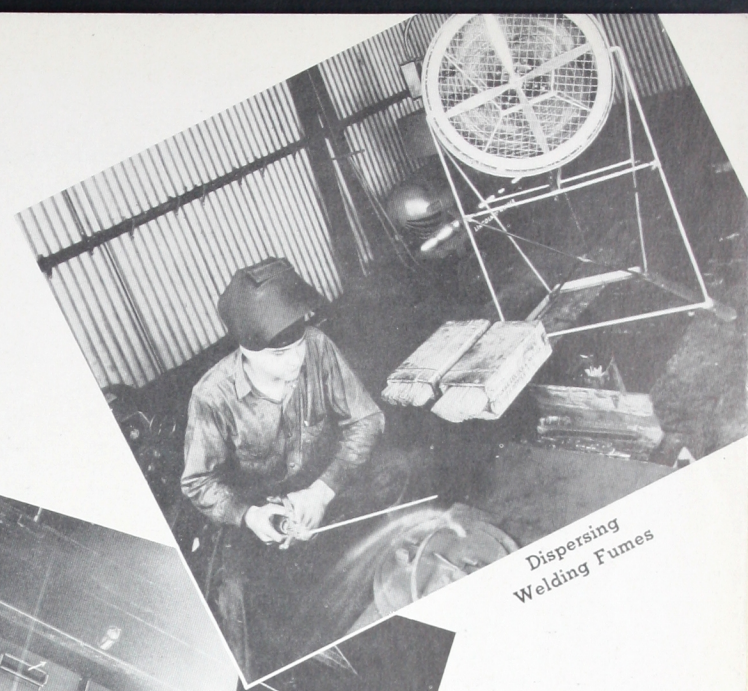
CHARAVAY Header



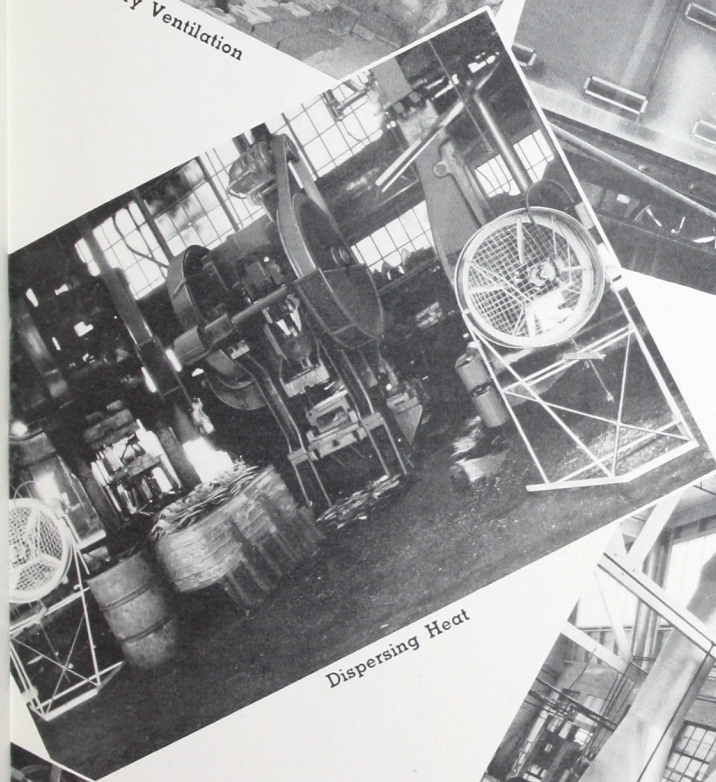
Above is a cutaway view of the Charavay header, which is tested under three hundred pounds pressure. Headers are of cast iron, tubes of copper. Tubes are rolled into headers in the approved boiler tube method and then orificed for uniform steam distribution.



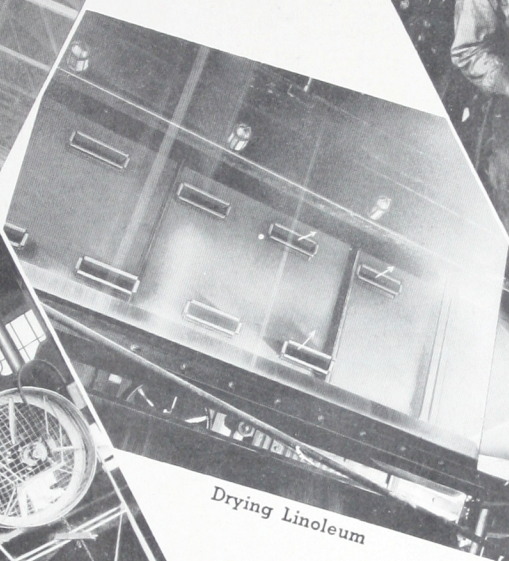
Foundry Ventilation



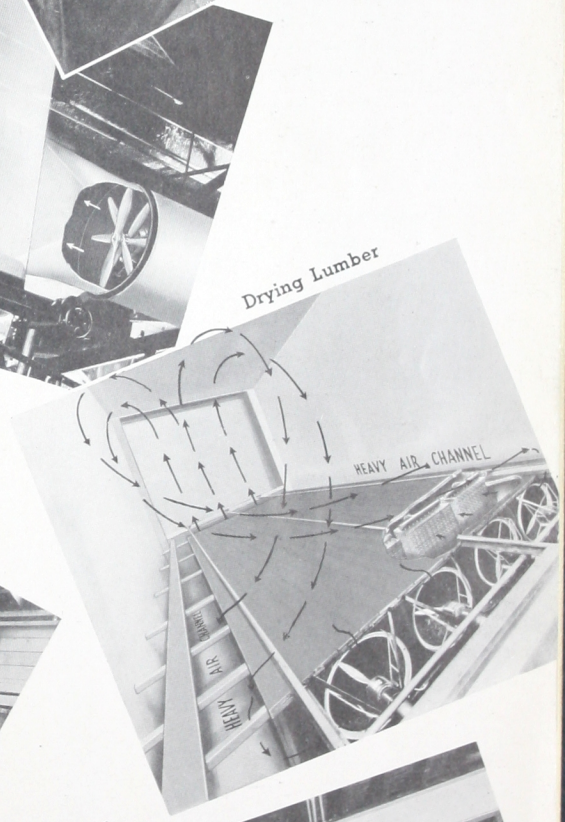
Dispersing
Welding Fumes



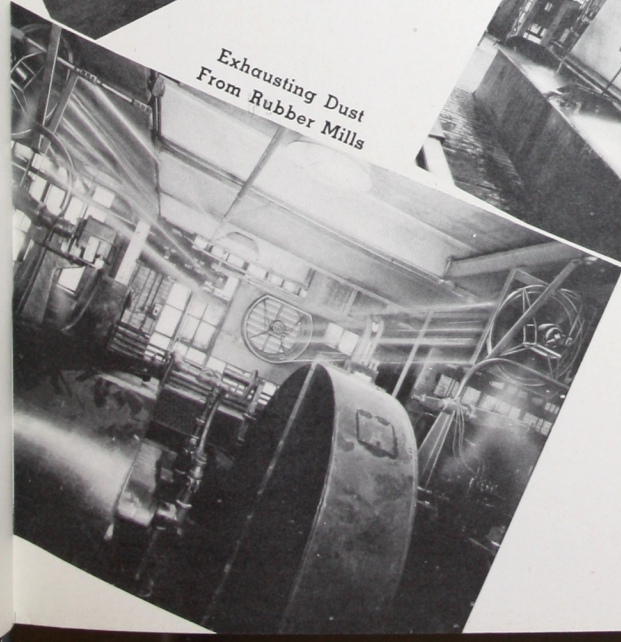
Dispersing Heat



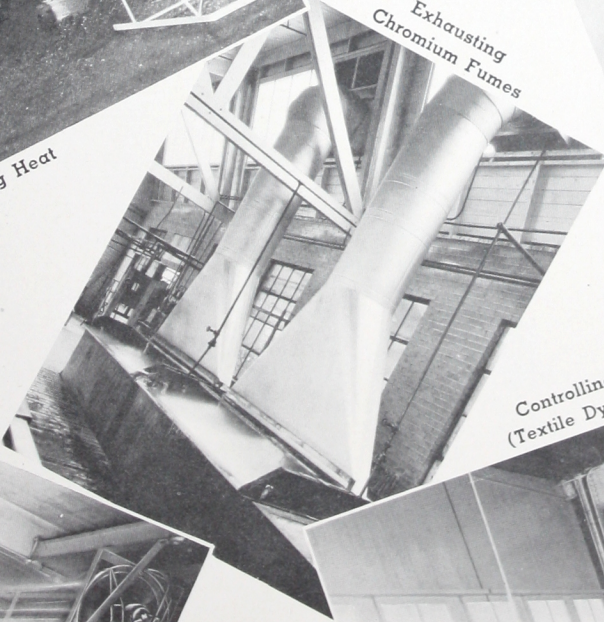
Drying Linoleum



Drying Lumber



Exhausting Dust
From Rubber Mills



Exhausting
Chromium Fumes



Controlling Fog
(Textile Dye Plant)

TABLE OF PIPE SIZES with Friction Loss in Water Gauge for Various Volumes of Air

Cu. Ft. of Air Per Min.	Friction Loss Per 100 Foot Straight Pipe							Cu. Ft. of Air Per Min.	Friction Loss Per 100 Foot Straight Pipe						
	.10" S. P.	.15" S. P.	.20" S. P.	.25" S. P.	.30" S. P.	.40" S. P.	.50" S. P.		.10" S. P.	.15" S. P.	.20" S. P.	.25" S. P.	.30" S. P.	.40" S. P.	.50" S. P.
100	6 "	5.5"	5 "	5 "	5 "	4.5"	4.5"	3500	24	22	21	19.5	19	18	17.5
200	7.5	7	6.5	6.5	6	6	5.5	4000	25	23	22	20.5	20	19	18
300	9	8	8	7.5	7.5	7	6.5	4500	26	24	23	21.5	21	20	19
400	10	9.5	9	8.5	8	7.5	7.5	5000	27.5	25	24	22.5	22	21	20
600	12	11	10.5	10	9.5	9	8.5	5500	28.5	26	25	23.5	23	22	21
800	13.5	12	11.5	11	10.5	10	9.5	6000	29.5	27	25.5	24.5	24	22	21.5
1000	14.5	13.5	12.5	12	11.5	11	10.5	6500	30.5	28	26.5	25	24	23	22
1200	16	14.5	13.5	13	12.5	12	11.5	7000	31.5	29	27	26	25	24	23
1400	16.5	15	14	13.5	13	13	12	7500	32	30	28	26.5	26	25	24
1600	17.5	16	15	14.5	14	12.5	13	8000	33	30.5	29	27	27	26	24
1800	18	17	16	15.5	15	14	13.5	8500	34	31.5	29.5	28	27	26	24.5
2000	19	17.5	16.5	16	15.5	15	13.5	9000	35	32	30	29	28	26	25
2500	21	19	18	17	17	16	15	9500	35.5	32.5	30.5	29	29	27	25.5
3000	22.5	21	19.5	18.5	18	17	16.5	10000	36	33	31	30	29	27.5	26

The figures in the body of the table are pipe diameters in inches.

90° elbow equals 10 diameters of pipe.

AREA AND CIRCUMFERENCE OF CIRCLES

And Sides of Squares of Equal Areas

Diam. in Inches	AREA		Circum- ference in Feet	One Side of a Square of Equal Area	Diam. in Inches	AREA		Circum- ference in Feet	One Side of a Square of Equal Area
	Square Inches	Square Feet				Square Inches	Square Feet		
1	.7854	.0054	.2618	.89	51	2043	14.19	13.35	45.20
2	3.142	.0218	.5236	1.77	52	2124	14.75	13.61	46.08
3	7.069	.0491	.7854	2.66	53	2206	15.32	13.88	46.97
4	12.57	.0873	1.047	3.54	54	2290	15.90	14.14	47.86
5	19.63	.1364	1.309	4.43	55	2376	16.50	14.40	48.74
6	28.27	.1964	1.571	5.32	56	2463	17.10	14.66	49.63
7	38.48	.2673	1.833	6.20	57	2552	17.72	14.92	50.51
8	50.27	.3491	2.094	7.09	58	2642	18.35	15.18	51.40
9	63.62	.4418	2.356	7.98	59	2734	18.99	15.45	52.29
10	78.54	.5454	2.618	8.86	60	2827	19.63	15.71	53.17
11	95.03	.6600	2.880	9.75	61	2922	20.29	15.97	54.06
12	113.1	.7854	3.142	10.63	62	3019	20.97	16.23	54.91
13	132.7	.9218	3.403	11.52	63	3117	21.65	16.49	55.83
14	153.9	1.069	3.665	12.40	64	3217	22.34	16.76	56.72
15	176.7	1.227	3.927	13.29	65	3318	23.04	17.02	57.60
16	201.0	1.396	4.189	14.18	66	3421	23.76	17.28	58.49
17	227.0	1.576	4.451	15.06	67	3526	24.48	17.54	59.38
18	254.7	1.767	4.712	15.95	68	3632	25.22	17.80	60.26
19	283.5	1.969	4.974	16.84	69	3739	25.97	18.06	61.15
20	314.2	2.182	5.236	17.72	70	3848	26.73	18.33	62.04
21	346.3	2.405	5.498	18.61	71	3959	27.49	18.59	62.92
22	380.1	2.640	5.760	19.49	72	4072	28.27	18.85	63.81
23	415.5	2.885	6.021	20.38	73	4185	29.07	19.11	64.99
24	452.4	3.142	6.283	21.27	74	4301	29.87	19.37	65.58
25	490.9	3.409	6.545	22.15	75	4418	30.68	19.63	66.47
26	530.9	3.687	6.807	23.04	76	4536	31.50	19.90	67.35
27	572.5	3.976	7.069	23.93	77	4657	32.34	20.16	68.48
28	615.7	4.276	7.330	24.81	78	4778	33.18	20.42	69.15
29	660.5	4.587	7.592	25.70	79	4902	34.04	20.68	70.03
30	706.8	4.909	7.854	26.59	80	5027	34.91	20.94	70.89
31	754.7	5.241	8.116	27.47	81	5153	35.78	21.21	71.80
32	804.2	5.585	8.378	28.36	82	5281	36.67	21.47	73.35
33	855.3	5.940	8.639	29.25	83	5411	37.57	21.73	73.55
34	907.9	6.305	8.901	30.13	84	5542	38.48	21.99	74.45
35	962.1	6.681	9.163	31.02	85	5675	39.41	22.25	75.48
36	1017.8	7.069	9.425	31.90	86	5809	40.34	22.51	76.22
37	1075.2	7.467	9.686	32.79	87	5945	41.28	22.78	77.10
38	1134.1	7.876	9.948	33.68	88	6082	42.24	23.04	77.99
39	1194.5	8.296	10.21	34.56	89	6221	43.20	23.30	78.87
40	1256.6	8.727	10.47	35.45	90	6362	44.18	23.56	79.76
41	1320.2	9.168	10.73	36.33	91	6504	45.17	23.82	80.65
42	1385.4	9.621	10.99	37.22	92	6648	46.16	24.09	81.54
43	1452.2	10.08	11.26	38.11	93	6793	47.17	24.35	82.42
44	1520.5	10.56	11.52	38.99	94	6940	48.19	24.61	83.31
45	1590.4	11.04	11.78	39.88	95	7088	49.22	24.87	84.19
46	1661.9	11.54	12.04	40.76	96	7238	50.27	25.13	85.08
47	1734.9	12.05	12.30	41.65	97	7390	51.32	25.39	85.96
48	1809.5	12.51	12.57	42.58	98	7543	52.38	25.66	86.85
49	1885.7	13.09	12.83	43.42	99	7698	53.46	25.92	87.74
50	1963.5	13.64	13.09	44.31	100	7855	54.54	26.18	88.63

A. I. A. FILE No. 30-D-1 HARTZELL PROPELLER FAN CO., PIQUA, OHIO

